Construction Methods

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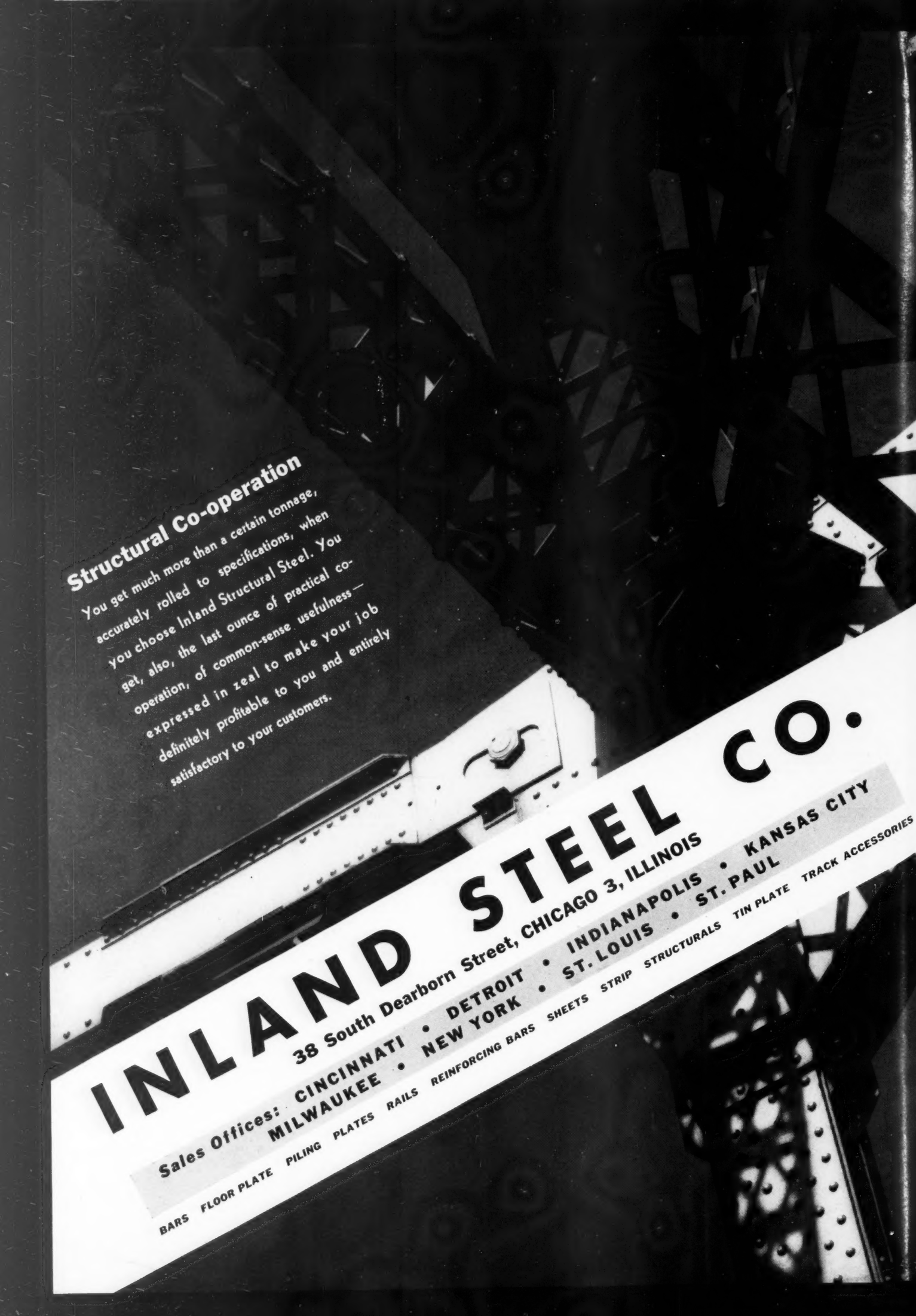
Reconversion . . .
for productive peacetime employment starts off with $200,000,000 construction program by automotive industry.

SEPTEMBER 1945

Release of Atomic Energy . . . What Is It? . . . Can It Be Controlled? . . .
What Possibilities Does It Portend? . . . Eight Pages on This Revolutionary Development
Swift Building of Huge Plants Aids Early Birth of Atomic Bomb
B-29 Bases in Marianas Hasten Downfall of Japan
Stilwell Road Grows Stronger Under Maintenance By Lt. Col. W. L. O'Donnell
Heavy Pavement for 175-Ton Planes
Constructors Defeat Winter Mud to Subdue Site for Rocket Plant


Structural Co-operation
You get much more than a certain tonnage, accurately rolled to specifications, when you choose Inland Structural Steel. You get, also, the last ounce of practical co-operation, of common-sense usefulness—expressed in zeal to make your job definitely profitable to you and entirely satisfactory to your customers.
INLAND STEEL CO.
38 South Dearborn Street, CHICAGO 3, ILLINOIS
Sales Offices: CINCINNATI • DETROIT • INDIANAPOLIS • KANSAS CITY
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BARS FLOOR PLATE PILING PLATES RAILS REINFORCING BARS SHEETS STRIP STRUCTURALS TIN PLATE TRACK ACCESSORIES

CURRENT JOBS

. . . and Who's Doing Them

BUILDINGS

Public—Army contract for depot at Sacramento, Calif., was awarded to **MacDonald & Kahn, Inc.**, of San Francisco, and **A. Teichert & Co.**, of Sacramento, for $6,214,000. **The Austin Co.**, of Cleveland, Ohio, has $4,000,000 contract for plant alterations at Kansas City, Kans., and $3,500,000 contract for plant alterations at Kansas City, Mo. Contract for housing in Chicago, Ill., went to **Sherry-Richards Co., of Chicago,** for $2,342,000. Navy contract for storehouse at Spokane, Wash., was awarded to **Sound-Kiewit Construction & Engineering Co.**, of Seattle, for $1,888,925. Low bid of $1,589,000 was received from **Haris Construction Co.**, of Brooklyn, N. Y. for housing at Anacostia, D. C. **J. & B. Manufacturing Co.**, of Houston, Tex., has $1,500,000 and $800,000 contracts on barracks and housing for overseas. Housing at Bremerton, Wash., will be constructed by **Nettleton & Baldwin,** of Seattle, for $1,407,376. Navy contract for $1,381,000 machine shop extension at Terminal Island, Calif., went to **James I. Barnes Construction Co.**, of Santa Monica. Office building at Suitland, Md., will be built by **Charles H. Tompkins Co.**, of Washington, D. C., for $1,322,000. **Nelse Mortensen & Co.**, of Seattle, Wash., has $1,145,000 housing contract at Bremerton. **Rubin Construction Co.**, of New York, N. Y., will build houses at Newark, N. J., for $1,138,696. Laboratory at Bethesda, Md., will be constructed by **Geo. A. Fuller Co.**, of Washington, D. C., for $1,055,000.

Industrial—Mill at Mobile, Ala., will be built by **H. K. Ferguson Co.**, of Cleveland, Ohio, for $3,000,000. **Giffels & Vallet,** of Detroit, Mich., has $2,500,000 contract for plant at South Bend, Ind. **Cunningham-Rudy Co.**, of Detroit, Mich., will build $1,750,000 plant at Pontiac. **Bryan & Detwiler Co.**, of Detroit, has $1,500,000 contract for plant at Detroit.

HEAVY CONSTRUCTION

Hydraulic fill at Idlewild, N. Y., will be built by **Atlantic Gulf & Pacific Co.**, of New York, for $3,088,453. Army contract for levees in California was awarded to **Winston Bros. Co.**, of Los Angeles; **Utah Construction Co.**, of San Francisco; and **Vinnell Co.**, of Alhambra, for $2,768,775. Navy contract for pipeline at San Diego, Calif., went to **S. A. Healy Co.**, of Chicago, Ill., for $2,597,344. Catapult improvements at Patuxent River, Md., will be built by **C. J. Langenfelder & Son.**, of Washington, D. C., for $1,319,820. **Peter Kiewit Sons Co.**, of San Francisco, Calif., has $1,163,340 contract for earthwork at Friant.

HIGHWAYS

Among recent highway contract awards are the following: Florida: $219,235 to **Atlantic Dredging & Construction Co.**, of Pine Bluff, Ark.; and $199,161 to **Belcher Oil Co.**, of Miami. Illinois: $684,595 to **S. J. Groves & Sons Co.**, of Minneapolis, Minn.; $502,500 to **O'Connor Construction Co., Inc.**, of Springfield; and $368,595 to **Milburn Bros., Inc.**, of Prospect. Kentucky: $209,495 to **Southern Ohio Quarries Co.**, of Columbus, Ohio. Maryland: $351,225 to **Hendrickson Bros., Inc.**, of Valley Stream, N. Y.; and $331,633 to **R. B. Jaggard,** of Westmont, N. J. New Mexico: $358,356 to **Henry Thygesen & Co.**, of Albuquerque. North Dakota: $505,214 to **Northern Improvement Co.**, of Bismarck. Pennsylvania: $296,675 to **Dinardo, Inc.**, of Pittsburgh. Tennessee: $248,008 to **A. B. Long, of Harriman.** Virginia: $301,740 to **T. E. Ritter Co.**, of Norfolk; and $220,882 to **Bero Engineering & Construction Co.**, of Langley Field. West Virginia: $202,634 to **A. S. Wikstrom,** of Bound Brook, N. J. Quebec: $300,000 to **H. J. O'Connell, Ltd.**, of Montreal.

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Construction Methods

A Pictorial Survey of Current Practice, Equipment and Materials

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ROBERT K. TOMLIN, Editor

Editorial Staff: Vincent B. Smith; Donald D. King; Nelle Fitzgerald; Patricia McGerr; Paul Wooton and A. N. Carter (Washington) N. A. Bowers (San Francisco)

SEPTEMBER, 1945

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THE How OF IT

For the benefit of readers concerned with the practical application of method or equipment the following references are to articles or illustrations in this issue that tell:

How **PERMEABLE PILE JETTIES** stopped river bank erosion —p. 81

How **TRADE SCHOLARSHIPS** aid good neighbor policy —p. 82

How **CONSTRUCTION FOR RECONVERSION** begins, as automotive industry builds $200,000,000 of new plant —p. 84

How **ATOMIC BOMB PRODUCTION** was speeded by fast work on huge plants —p. 88

How **WORN EQUIPMENT** was kept in service by stepped-up maintenance —p. 91

How **SUPERFORTRESS BASES** were constructed in record time by Aviation Engineers in Marianas —p. 92

How **TANK CAR HEATERS** circulated steam through overhead pipes to plant for melting solid asphalt from drums —p. 94

How **ROCKET PLANT** was completed on schedule after slow start in winter mud —p. 96

How **THICK CONCRETE PARTITIONS,** without reinforcement, were used to compartmentalize buildings which handle explosives —p. 97

How **HEAVY CONCRETE TEST SECTION** was constructed for 175-ton planes at Moffet Field —p. 102

How **FINISHED PAVEMENT SECTIONS** were diked and ponded for curing —p. 103

How **TRUCK-MOUNTED SHOVEL** stripped old asphalt from street and loaded it into trucks —p. 104

How **CALCIUM CHLORIDE SOLUTION** was used in place of air for tire inflation —p. 105

How **STILWELL ROAD INTO CHINA** was built up by maintenance under traffic —p. 106

How **MECHANICAL AIDS** cut cost of clearing TVA reservoirs —p. 110

How **STEPPED CONCRETE PILES** supported 10-story wings of veterans' hospital —p. 114

How **PHILIPPINE RAILROADS** were rebuilt by Army Engineers —p. 116

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JAMES H. McGRAW, Founder and Honorary Chairman

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IMPROVED HD-10

A better performer than ever with extended track! More track on the ground means greater traction — more grip, more drawbar pull! Cuts scraper loading time, speeds bulldozing and hauling work . . . insures better footing on every type of soil. Operators will like its smoother, easier riding. Owners will welcome increased work capacity.

More good news . . . HD-10's are now more readily available to essential users. In case you have to wait temporarily . . . it will be well worth while waiting for the *improved* HD-10!

L·O·N·G·E·R T·R·A·C·K

Over ten per cent increase in ground contact is gained with longer track . . . ground pressure reduced. Addition of a truck roller on each track reduces wear and tear. More tractor weight — approximately 860 pounds — assures better all-'round performance.

— Gives You

IMPROVED TRACTION
IMPROVED BALANCE
IMPROVED RIDING . . .
IMPROVED PERFORMANCE!

ALLIS-CHALMERS

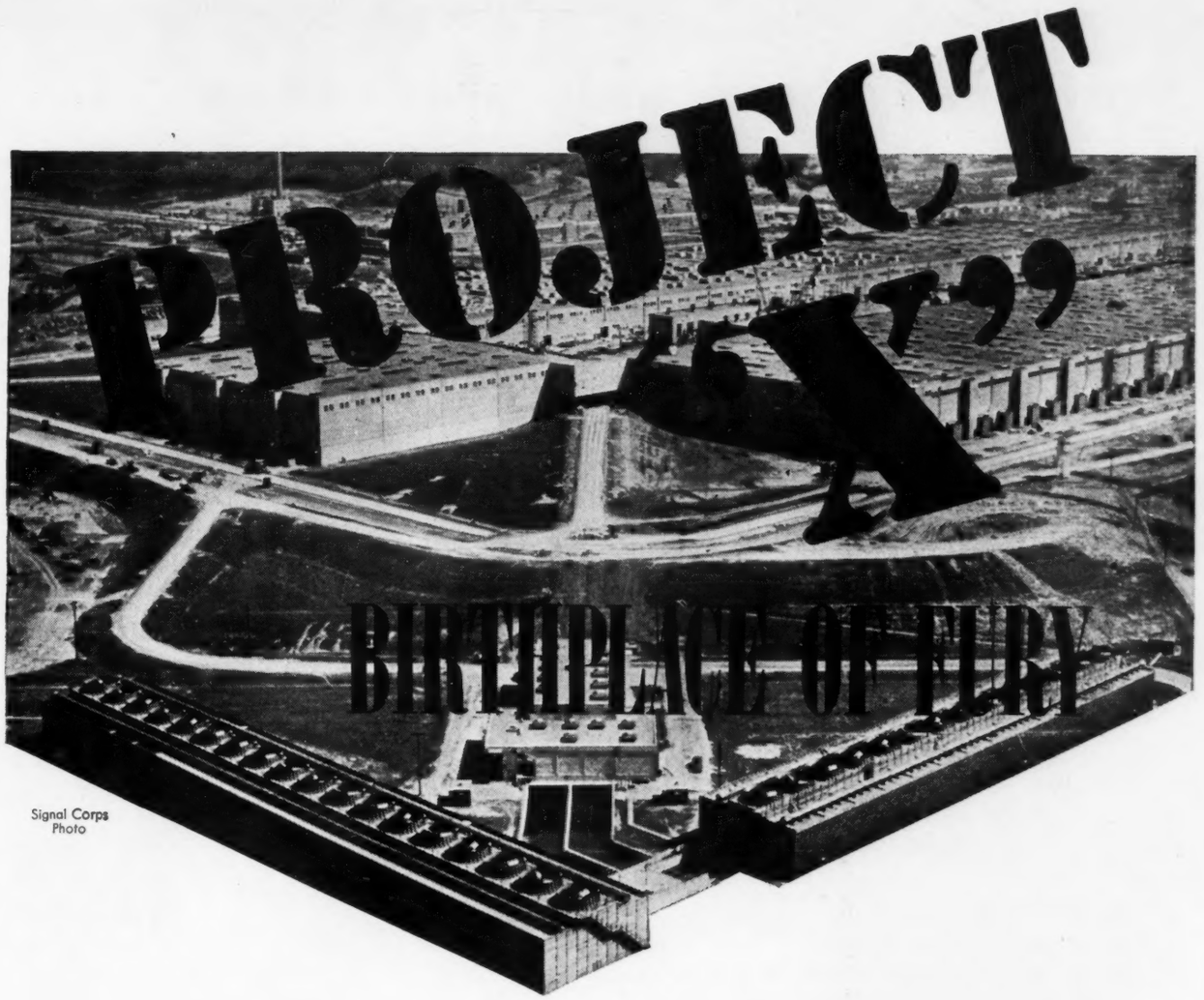
TRACTOR DIVISION · · MILWAUKEE 1, U. S. A.

THE JOB JESTER

CARTOONS DRAWN FOR CONSTRUCTION METHODS

"Get that equipment distributor on the phone. I'm fed up with the way he delivers his bills."

"There's my wheelbarrow!"



Signal Corps Photo

LONE STAR PRODUCTS HELPED SPEED PRODUCTION OF FATEFUL ATOMIC BOMB

Concrete played an important part in speeding production of the fateful atomic bomb which marked the war's end and a new era's beginning. Lone Star Cement Corporation products shared in the construction of the 59,000-acre Manhattan Project, Oak Ridge, Tenn. Known now as Clinton Engineering Works, to us it was simply Project "X", for this was indeed the war's best-kept secret.

All the world knows of the brilliant achievement of the pooled scientific knowledge of free men in harnessing atomic energy to its initial use. But a word of acknowledgment is also in order for the construction skills—and materials—which went into the record-breaking completion of the necessary plant facilities.

The construction industries which paced the nation's war-production program will expedite the shift-over to civilian production. And the selective use of Lone Star Cement Corporation products will play its part in speeding a new day in a new America.

LONE STAR CEMENT CORPORATION

Offices: ALBANY · BIRMINGHAM · BOSTON · CHICAGO · DALLAS · HOUSTON · INDIANAPOLIS · JACKSON, MISS.
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LONE STAR CEMENT, WITH ITS SUBSIDIARIES, IS ONE OF THE WORLD'S LARGEST CEMENT PRODUCERS: 15 MODERN MILLS, 25-MILLION BARRELS ANNUAL CAPACITY

Uniformity here aids production . . .

EVEN SPOOLING

comes naturally to flexible *PREFORMED* YELLOW STRAND

A wire rope that winds tightly and evenly on the drum helps equipment work at capacity. But you might wonder—if you didn't know *Preformed* Yellow Strand—how any line could overcome some common obstacles to good spooling.

The drum itself may be too small. Often there's erratic alignment . . . too much speed for the load, whether light or heavy . . . excessive slack. Such faults can bedevil an unpreformed rope—already burdened by unruliness—into pulling away from the adjoining wrap, climbing back over the high layer or crisscrossing at will.

Not so with limber *Preformed* Yellow Strand. By preshaping wires and strands we've relaxed internal stresses and improved the defense against *external* bends. The line spools uniformly because it takes *naturally* to drum grooves and the channels between rope coils.

The same smooth-running qualities promote sheave efficiency. Slippage and abrasive wear decline. Both rope and parts last longer.

Specify *Preformed* Yellow Strand by name. Get all you should in wire rope performance and economy. Broderick & Bascom Rope Co., St. Louis 15, Mo. *Branches:* New York, Chicago, Houston, Portland, Seattle. *Factories:* St. Louis, Seattle, Peoria.

HAND BOOK FREE: "Industrial Wire Ropes" contains useful facts, tables, pictures. Write for your copy.

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BRODERICK & BASCOM

Yellow Strand

PREFORMED WIRE ROPE

Increased Yardage *and* Lower Hauling Costs *on Off-the-Highway Jobs*

Whether it is coal hauling in Pennsylvania, dam construction in Idaho, or any job of moving earth and other materials, Euclids step up production and cut hauling costs. Because they are designed and built for the toughest jobs, Euclids have an unsurpassed range of usefulness and can handle all types of material on all lengths of haul at lower operating and maintenance costs. With their large payload capacity and speed on the haul road, this means savings in time and money — lower costs per ton or yard moved.

If you're using equipment that limits the type of work and lengths of haul you can handle economically, and can't take the tough jobs in stride, you will want to get complete information on Euclids. Literature and the recommendations of a hauling equipment specialist are available from your Euclid distributor or by writing direct, as you prefer.

The EUCLID ROAD MACHINERY Co. · · · Cleveland 17, Ohio

EUCLID SELF-POWERED HAULING EQUIPMENT For EARTH . ROCK . COAL . ORE

WE'VE GOT TO DO MORE THAN TALK ...AND QUICK!

Almost everybody today agrees that an adequate highway program is absolutely essential to a sound post-war economy. In fact, Congress has already voiced its approval by providing three billion dollars of federal funds.

Yet despite all the talk, the job of turning plans into blueprints is still far behind schedule!

Your state, your county has a tremendous responsibility in this important task. For unless adequate construction plans are completed and readied for bids immediately, it will be impossible to provide enough jobs to support the millions of returning service men and workers being released from war plants.

So unless we want "another WPA," it's up to all of us—engineers, public officials, contractors, distributors and manufacturers —to exert every possible effort to speed the completion of local plans, and to support competitive bidding as the one best way to build the kind of roads America needs at lowest possible cost to the Taxpayer. LaPlant-Choate Manufacturing Co., Inc., Cedar Rapids, Iowa; San Leandro, California.

LACK OF PLANS JEOPARDIZING HIGHWAY PROGRAM

by Charles M. Upham—Engineer-Director
American Road Builders' Association

"With the need great and with funds available, we might well imagine all state and local highway departments busy as beavers turning out blueprints, writing specifications and doing all those engineering tasks which must be done before contracts can be let and the actual work started. Unhappily this is not the case. Only eight states have sufficient plans ready to make an adequate start; and this lethargy and delay may jeopardize the entire post-war program. It is a matter that concerns every reader of this publication for the condition of the nation's highways affects all of us, no matter where we live or what we do. The answer is to appeal to those charged with preparing plans to get busy immediately."

FOR REAL ECONOMY IN EARTHMOVING BETTER SEE THE NEW LPC'S

High-Speed Scrapers

Tractor-Drawn Scrapers

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ARMY NAVY E

LAPLANT EARTHMOVING AND LAND **CHOATE** CLEARING EQUIPMENT

Announcing

ROSIN RUBBER

—a new tire-type synthetic rubber that adds miles to your tires

NOW you can get better truck tires—tires made with a new kind of synthetic rubber—the first major improvement announced by any tire manufacturer since before the war.

These tires are made from a special synthetic rubber using rosin base soap as emulsifying agent.

Discovery of this superior rubber was made in the research laboratories of The B. F. Goodrich Company, and early development was undertaken by this company and others working on the cooperative government synthetic rubber research program. The full scale production of this new rubber and its application for tire use were pioneered by B. F. Goodrich. First tests were so startling that hundreds of tires were quickly built. Now tires made with the new rubber have undergone more than 3,000,000 miles of intensive testing under all road and climatic conditions.

Here's what these tests show as superiorities compared to tires made with ordinary synthetic rubber:

1. greater resistance to cracking
2. greater resistance to bruising
3. cooler running
4. better tread wear
5. ability to withstand higher speeds

All B. F. Goodrich truck and bus tires are now made with this new type rubber. These tires are not as good as natural-rubber truck tires but they are far and away the best synthetic truck tires we have ever built—offering you longer wear and more miles per dollar than tires built of ordinary synthetic.

B. F. Goodrich research continues to improve tires for every purpose. See the B. F. Goodrich man first for help on conservation, for service, for tires.

Truck Tires BY

B.F. Goodrich

FRUEHAUF

A GOOD NAME TO HAVE ON YOUR TRAILER

WHEN THE NAMEPLATE on your Trailer reads "Fruehauf" you are sure of several things.

You know that the Trailer you purchased was designed especially for your job—that there was no attempt to give you size or model "almost correct."

You know that it was built with a full realization that you are concerned with uninterrupted performance—with a Trailer's ability to stay on the job!

And, you know that back of it is not only a nation-wide service organization, but a company which has grown big by adhering to the sound principle "The Customer Is Boss."

World's Largest Builders of Truck-Trailers

FRUEHAUF TRAILER COMPANY • DETROIT 32

Service in Principal Cities

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Another
NORTHWEST
WEST-BOUND
for Isbell Construction Co.
makes fourteen
14
Everybody in the West knows Isbell Construction Co.—knows their many years service to the construction industry—knows them for good operators.
It is significant that they have used Northwest Shovels, Cranes and Draglines for many, many years and are just adding their 14th Northwest to their fleet.
You are making postwar plans—thinking about the equipment you may want to own, comparing in your mind. Why not get acquainted with Northwest now. Learn about the advantages that Northwest alone has for you—and remember that one out of every three Northwests sold was a repeat order in the hands of one of the country's leading contractors.
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1728 Steger Building
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NEVADA
RENO
NORTH WEST
if you have a Real Rock Shovel you'll never have to worry about output in dirt.
NORTHWEST
SHOVELS • CRANES • DRAGLINES

Then he said to himself

"No Joy–No Strength"

HIGH point in faith toward a losing technique was exhibited by "Herr Doktor" Ley . . .

—leader of Hitler's "Strength Through Joy" Youth Movement.

Sitting between two GI's who had frisked him of his cyanide vial, he unjoyfully maintained:

"Adolph Hitler was Germany's greatest man."

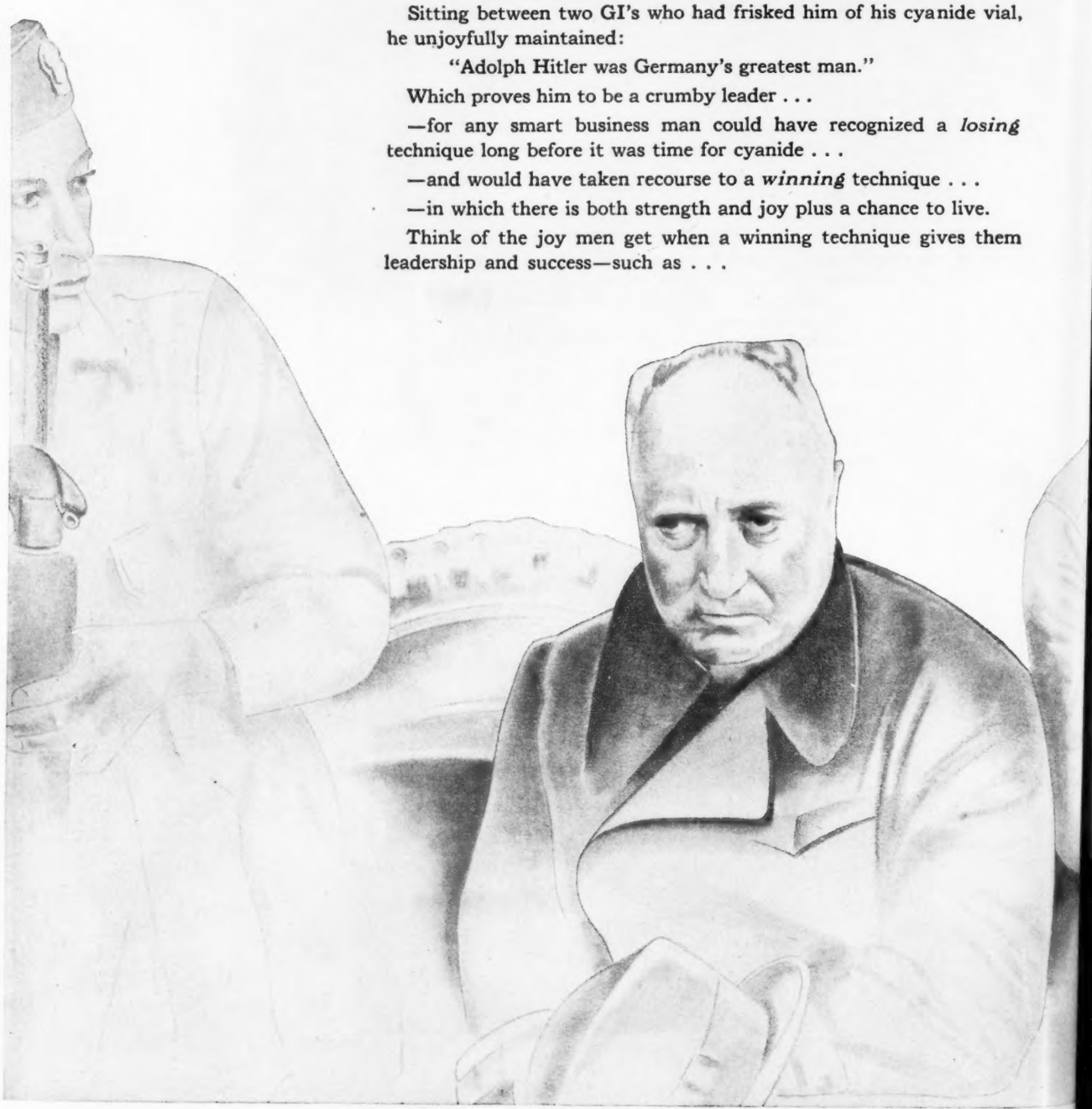
Which proves him to be a crumby leader . . .

—for any smart business man could have recognized a *losing* technique long before it was time for cyanide . . .

—and would have taken recourse to a *winning* technique . . .

—in which there is both strength and joy plus a chance to live.

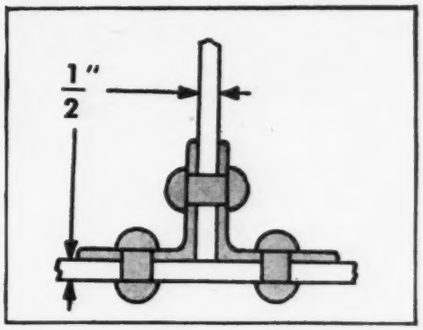
Think of the joy men get when a winning technique gives them leadership and success—such as . . .

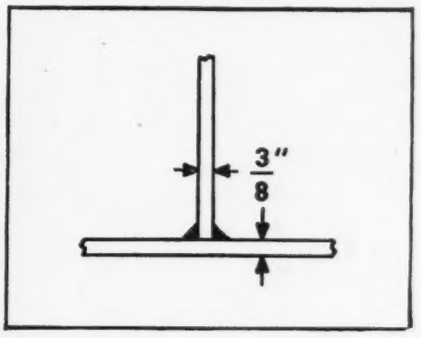


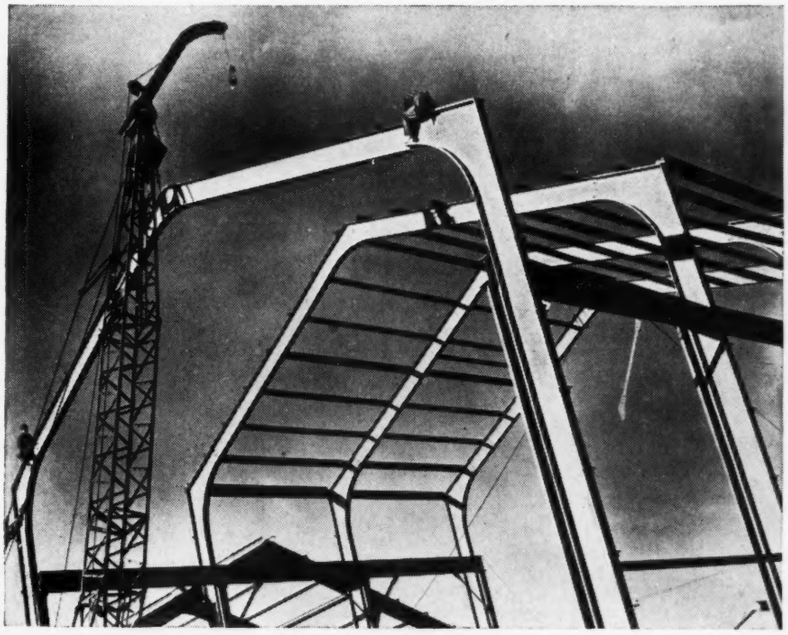
LOOK, HERR DOKTOR, how to obtain

STRENGTH THROUGH WELDING

Competitive and Physical Strength. Lower costs and improved structures are obtainable through welded design. This riveted T connection, with $\frac{1}{2}$" *plate* and *15 lbs.* of connecting material per ft., has a joint capacity of *96,000* lbs. per ft. . . . The welded connection, with $\frac{3}{8}$" *plate* and 1 lb. of connecting material per ft., has a joint capacity of *102,000* lbs. per ft.







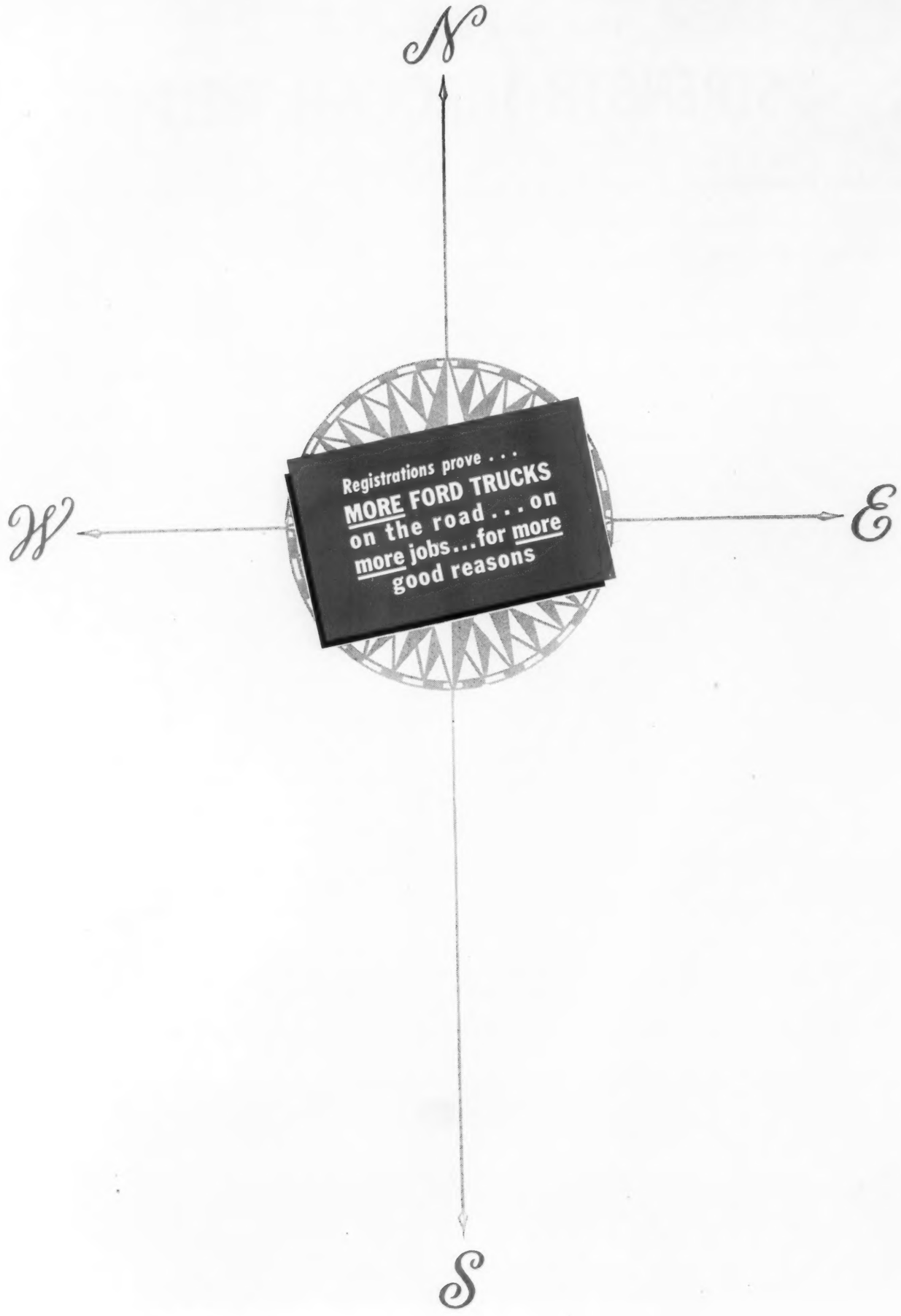
This rigid frame structure built for a large chemical company in Bay City, Mich., illustrates the strength and rigidity of welded construction. Makes possible prefabrication of large roof sections and speedy assembly in the field. Absence of conventional trusses improves appearance, lighting and maintenance of building. Designed, fabricated and built by the Austin Company, Cleveland, Ohio.

Lincoln Engineers will gladly help you apply this winning technique to the solution of your problems of design, fabrication and erection. Studies in Structural Arc Welding free on request. Ask for on your business letterhead.

THE LINCOLN ELECTRIC COMPANY • DEPT. V-1 • CLEVELAND 1, OHIO

America's greatest natural **recourse**

ARC WELDING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Registrations prove . . .
MORE FORD TRUCKS
on the road . . . on
more jobs . . . for more
good reasons

LITTLEFORD

LB — JUDGE TOP ROAD MAINTENANCE EQUIPMENT — SINCE - 1900

"SPRAY MASTER"

The Master of Road Building

When building or maintaining Roads, Streets, Highways or Airport Runways let the "Spray Master" speed up work; cut the cost of applying Tar, Asphalt, Emulsions or Road Oils.

The "Spray Master" with the *Vacuum Flow Full Circulating Spray Bar* is one of the fastest and most efficient spraying units ever designed. This Circulating Bar circulates the materials through the Bar by *vacuum, not pressure.* It sprays under pressure with a Bar up to 24 ft. in width.

"Spray Master" is the master of Road Building. Have one of these low-cost Spraying units on your next road construction job.

HANDLES HOT OR COLD MATERIALS

LITTLEFORD BROS., INC. . . . 465 EAST PEARL ST., CINCINNATI, OHIO

Is your ROPE-RIGGED for the big job ahead?

No time like *now* to check over your equipment's readiness . . . for the big competitive job ahead. And in checking your wire rope, include these points:

Are sheaves and drums regularly checked for excessive wear that would injure the rope operating over them? Does the rope get proper handling, lubrication, inspection, maintenance? Is it Roebling "Blue Center" Steel Wire Rope?

If the answers are "yes", bank on dependable, long-lasting, economical rope service . . . for today's toughest, tomorrow's biggest jobs. For "Blue Center", preformed or non-preformed, combines smooth-running flexibility with high abrasion-and-fatigue resistance . . . and extra strength for extra duty!

It's the result of fine Roebling steel, exceptional equipment, a century-old tradition of sound workmanship. And whether *your* rope problem is one of selection, operation or maintenance, Roebling engineering service can help you solve it . . . to your advantage.

As government needs taper off, Roebling wire rope will again be available to non-priority users, in order of precedence. Why not place *your* order now?

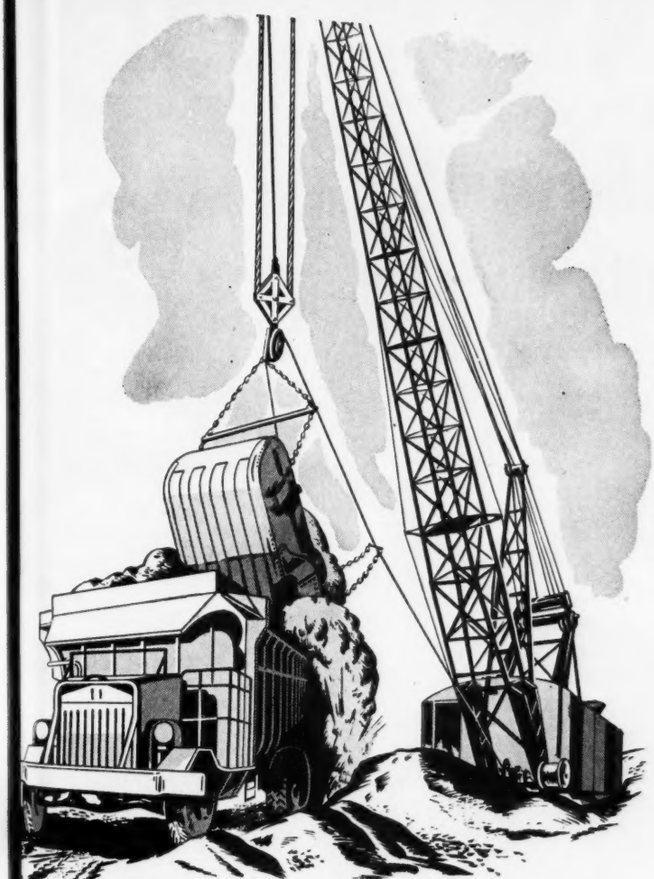
JOHN A. ROEBLING'S SONS COMPANY
TRENTON 2, NEW JERSEY
Branches and Warehouses in Principal Cities

Wire Rope and Strand • Fittings • Slings • Cold Rolled Strip • Round and Shaped Wire • Wire Cloth and Netting • High and Low Carbon Acid and Basic Open Hearth Steels • Aircord, Swaged Terminals and Assemblies • Suspension Bridges and Cables • Electrical Wires and Cables • Aerial Wire Rope Systems

ROE

PACEMAKER IN W

EQUIPMENT *ready...*



ROPE REMINDERS

Because sheaves play such an important part in wire rope life, we make it a point to stress their periodic, careful inspection.

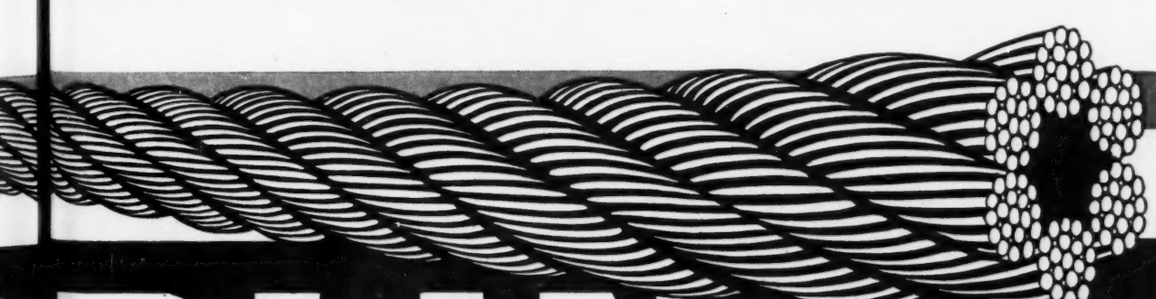
Take the matter of inspecting sheave grooves: At the start of service, the groove's diameter should bear the proper relation to the diameter of the rope to be used in it.

With constant passage of the rope over the sheave in normal operation, the groove is worn deeper, its diameter decreased. If a new rope is placed in this groove, it will be forced down and pinched out of shape. The result is an out-of-round, unbalanced rope, subject to severe abrasion against the sides of the groove.

Suppose the rope is placed in a sheave groove of too great diameter. Without proper side support, it will tend to flatten out.

Ideally, for the rope to have freedom of action with a maximum of support the sheave groove should support just less than half the rope's circumference.

Gages for measuring sheave grooves can be obtained from your Roebling representative. Use them, frequently. It will pay off in longer, more satisfactory rope life.



BLING

JR ROEBLING

WIRE PRODUCTS

Follow the Trend
to MOBILE shovels

mounted on big rubber, self-propelled chassis with one-man control, and Full Circle operation . . .

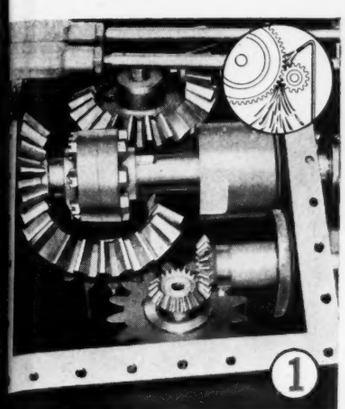
ENTIRELY ONE-MAN OPERATED FOR DIGGING OR TRAVELING—NO EXTRA DRIVER
DIGS ON ALL FOUR SIDES LIKE A CONVENTIONAL FULL CIRCLE CRAWLER SHOVEL
SHORT COUPLED, BIG RUBBER SELF-PROPELLED, 4-WHEEL DRIVE CHASSIS ALWAYS READY TO TRAVEL ON HIGHWAYS.
TOMORROW'S SHOVEL IS HERE TODAY!

BYERS HALF YARD TRAVELER

BYERS HALF YARD TRAVELER

Sets the Pace!

THE *Trend* IS TO OPERATING ADVANTAGES LIKE THESE!



1. Less Wear, Lower Maintenance Cost

Gears enclosed in oil-tight housings and lubricated by force-feed circulation. Gears submerged in oil.

2. One Man Control—Flexibility

All operations of traveling or operating are performed by *one man* located in operator's clear, wide visioned control cab.

3. Convenient, Accessible Controls

All control levers and foot pedals conveniently grouped so one man can perform all operations easily without leaving his seat. Clutches controlled by finger-touch levers with air pressure . . . not by push, pull and grunt.

4. Improved Air Clutches

Here is cross section view of the "Traveler's" Airflex clutch used for hoist, swing, crowd, boom hoist and travel transmission. It is a masterpiece of simplicity, is engaged by inflating with air, is released by deflating.

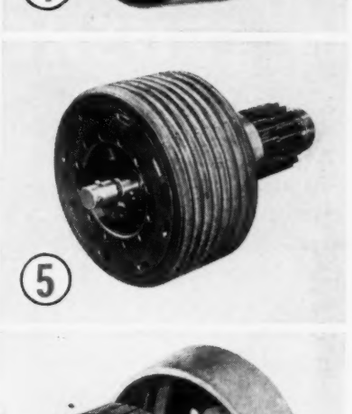
5. Air Clutch Runs Cool

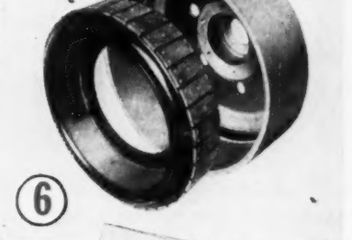
Airflex swing clutch shown here runs so cool, even in warmest weather, that operator can hold his bare hand on finned outer surface of clutch. This is proof of clutching efficiency, freedom from excessive wear.

Full 360° clutch contact with friction surface provides remarkably smooth starting, no jerks, no chattering. Airflex is trouble free because it eliminates adjustment and continual maintenance. There are no clutch adjustments to make *or that can be made.*

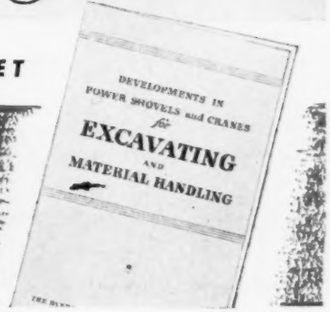
6. Airflex Eliminates Clutch Troubles

Efficiency of this clutch has been proved over many years in varied applications. It requires no maintenance because it has no toggles, no levers, no bell cranks, no connecting pins, no shifter collars, no springs to wear or get out of adjustment.





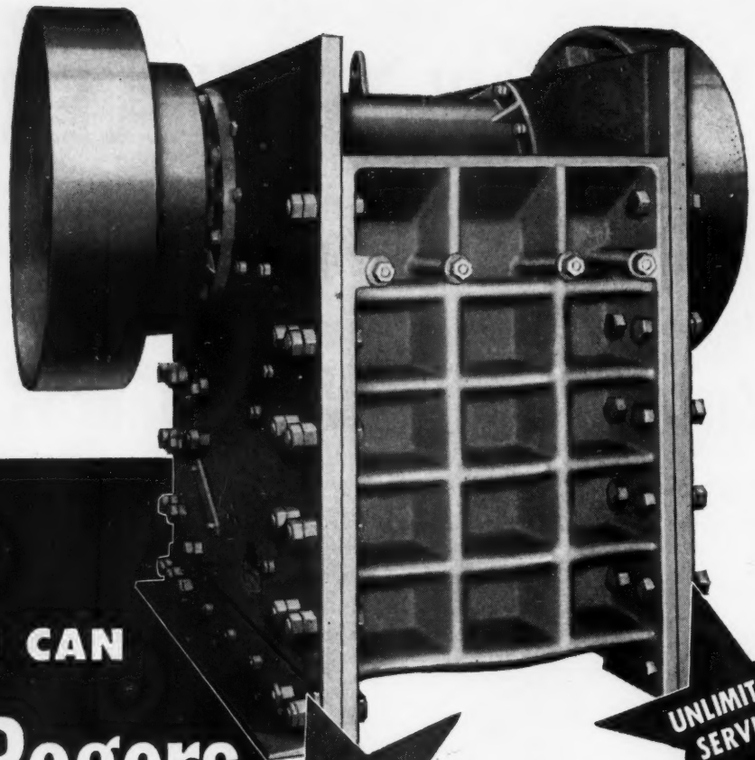
WRITE TODAY FOR THIS NEW ILLUSTRATED BOOKLET



THE BYERS MACHINE COMPANY

RAVENNA, OHIO

Distributors Throughout the World



WHY YOU CAN

Rely on Rogers

JAW CRUSHERS

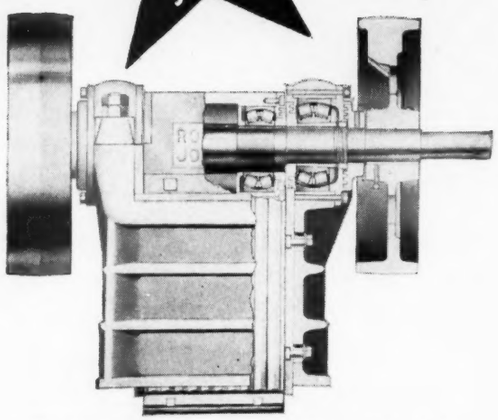
MORE CAPACITY

GREATER STRENGTH

UNLIMITED SERVICE

Oversize bearing and shaft diameters—from two to three sizes larger than normally used—are a big reason why *there has never been a bearing or shaft failure in a Rogers Jaw Crusher* and why Rogers Crushers have a greater rock reduction capacity. The Rogers line of Jaw Crushers is complete, in 16 sizes from a small reduction to a large primary crusher with large jaw opening.

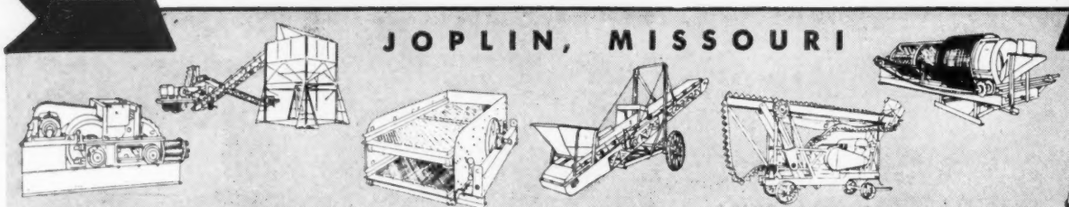
Rogers Rock Reduction machinery for crushing, sizing, conveying and storing has a reputation for reliability, strength and precision performance that has made Rogers a name for economical and efficient operation all over the world. For a single unit or a complete plant, you can always "Rely on Rogers".



The heart of the Rogers Jaw Crusher—oversize shaft and anti-friction bearings. (Also available with bronze bearings.) Write for complete descriptive bulletin today.

ROGERS IRON WORKS CO.

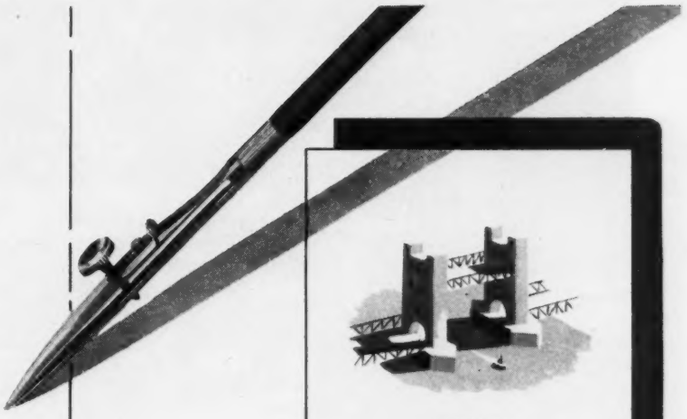
JOPLIN, MISSOURI



Quarry Plants • Gravel Plants • Jaw Crushers • Roll Crushers • Belt Conveyors • Bucket Elevators • Screens • Feeders • Steel Bins

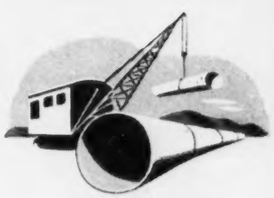
CONSOLIDATED STEEL PRESENTS...

...seven ideas in steel–the kind of jobs Consolidated Steel is prepared to help you plan and build *now*.

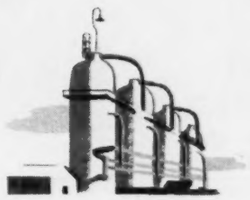


BRIDGES

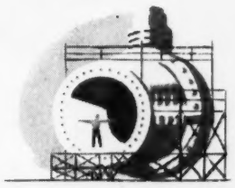
INDUSTRIAL BUILDINGS



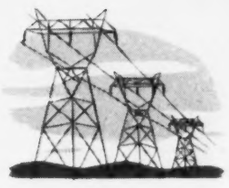
PIPE LINES



PETROLEUM EQUIPMENT



LARGE VALVES



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TANKS

If your postwar plans call for precision steel fabrication, Consolidated Steel is ready to offer you swift, capable service. Address Consolidated Steel Corporation, 5700 South Eastern Avenue, Los Angeles 22, California. Other plants at Orange, Texas, and at Long Beach, Wilmington, and Newport Beach, California.

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ENGINEERS
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FREE! This 36-page booklet tells why Texaco Rustproof Compound prevents rust, where and how to apply it, and how it can add extra years of life to your equipment. A single suggestion in this book may save you thousands of dollars. Write for your copy today.

TUNE IN THE
TEXACO STAR THEATRE
WITH JAMES MELTON
EVERY SUNDAY NIGHT
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TEXACO

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3-WAY PROTECTION AGAINST RUST

. . . when you use the rustproof compound that

1. Prevents rust formation on all exposed metal surfaces
2. Penetrates existing rust and stops further rusting
3. Loosens existing rust and makes it easy to remove

IN STORAGE or in use—equipment used by contractors, waterworks and sewage disposal plants needs the positive protection against destructive rust assured by *Texaco Rustproof Compound.* Because one application usually provides year-round protection, *Texaco Rustproof Compound* is very economical.

Texaco Rustproof Compound forms a soft, self-sealing film that remains completely waterproof and is highly resistant to chemicals and fumes under the severest conditions. It can be applied easily to most surfaces with a paint brush, or thinned down and sprayed to reach inaccessible parts. When necessary, it can be removed quickly with a kerosine-saturated rag.

Because of its proved effectiveness, *Texaco Rustproof Compound* is widely used throughout the construction field, as well as by leading railroads, in metal working plants, marine and refrigeration service, automotive, aviation and chemical industries, and, in general, wherever equipment is subject to corrosion.

Get *Texaco Rustproof Compound* today—available through more than 2300 Texaco distributing plants in the 48 States. Call the nearest one, or write: The Texas Company, 135 E. 42nd St., New York 17, N.Y.

Rustproof Compound

"Enginairing"

permits greater tonnage trains . . .
permits work boats to handle more cargo

The whole history of industrial progress in America can be summed up in one phrase: the continuous development of machines and equipment that do bigger and bigger jobs better and better!

This development brought a number of problems that Enginairing has helped, and is helping, to solve. As railroad trains got longer, for instance, greater flexibility in applying and releasing the brakes throughout the length of the train was essential. How well Enginairing did the job is shown by the mile-long trains that are handling the greatest freight traffic in the history of transportation.

Enginairing is making a big contribution in another field too—work boats . . . floating derricks. Instead of muscling a long row of heavy levers, the operator governs all functions by the movement of a few small handles. The magic of air multiplies a finger touch on the controls to any operating pressure needed, and simple interlocks prevent accidental damage to the equipment.

In post-war days, pneumatic controls may help you in modernizing your products, and streamlining your production. When that time comes, remember that Enginairing will be ready to serve you.

WESTINGHOUSE AIR BRAKE COMPANY

INDUSTRIAL DIVISION

General Offices:
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WABCO PACKING COMPRESSORS REMOTE CONTROLS

the *NEW* versatile medium-weight . . .

SULLIVAN K-61 paving breaker

. . . for light demolition work, cutting asphalt, trenching, back-fill tamping, spading in hard ground, driving bolts and spikes . . . the K-61 is an "all-around" tool.

• "Younger Brother" of the popular Sullivan K-81 breaker, this 65 pound K-61 is the ideal machine for anyone who needs a powerful, rugged breaking tool . . . of lighter weight.

Operator fatigue is minimized because the piston never strikes the fronthead. A cushion of air absorbs the blow and eliminates jarring and vibration . . . yet, the full force of the blow is delivered direct to the steel. The two sturdy "U" Type side rods eliminate side rod breakage and allow a comparatively smooth cylinder to provide a comfortable working surface for the operator's leg . . . an exclusive feature found only on Sullivan breakers.

Owners of Sullivan K-81 breakers like the interchangeability of many parts between K-81 and K-61 breakers. Repair parts stocks are kept at a minimum . . . the same tools may be used on either machine, an added saving. Write today for complete details about this new breaking tool.

Sullivan Machinery Co., Michigan City, Indiana. In Canada: Canadian Sullivan Machinery Co., Ltd., Dundas, Ontario.

with the thrifty Sullivan **DUAL VALVE** that makes air do more work!

PRODUCTS

Portable Compressors • Stationary Compressors • Rock Drills • Wagon Drills • Core Drills • Portable Hoists • Paving Breakers • Trench Diggers • Sheeting Drivers • and other Pneumatic Tools

A world-wide organization . . . established 1851

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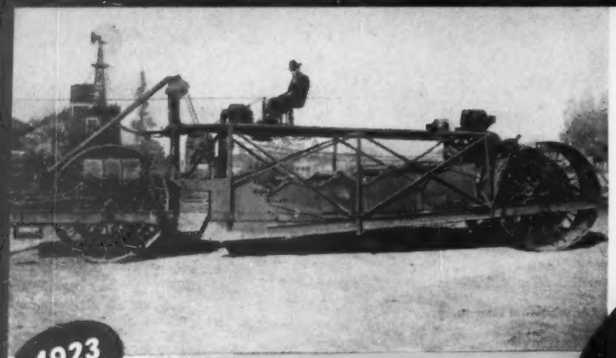
TOURNAPULLS GIVE YOU



1923 First self-propelled, electrically-controlled Scraper, forerunner of today's Tournapull.

1938 Basic Tournapull design was proved on 13,000,000-yard Hansen Dam, Calif., where Guy F. Atkinson Co. used 13 of these 30-yard Tournapulls.

1940 Smaller 11-yard rig extended Tournapull profits to average-size construction jobs. On this 300,000-yard Washington Highway contract, Elliott & Co., Inc., moved dirt faster and at lower cost with 4 Tournapulls.

YOU CAN'T BUY IN ANY OTHER HIGH-SPEED SCRAPER UNITS

LeTourneau originated, pioneered and developed the modern high-speed rubber-tired prime movers and scrapers that have revolutionized the dirtmoving business. Through 8 years of on-the-job experience accompanied by continual improvement, over 3500 of these Tournapull units have been built and shipped, providing a background of field testing and performance records, plus basic and supplementary patents, shared by no other manufacturer. The Carryall Scraper and Power Control Unit used with the Tournapull have been perfected over 17 years and have been voted tops by dirtmovers who have bought 23,000 Carryalls and 66,000 LeTourneau Power Control Units.

TOURNAPULLS LEAD RUBBER-TIRED TREND

This unequalled world-wide experience under every test of climate, weather, application, materials and abuse has led to a realistic evaluation of every detail of a basic idea which has proved so fundamentally right that it has now become accepted

1945 The combined manufacturing and job experience of 3500 rigs is incorporated into today's 15-yard Tournapull — since 1941 delivering lowest-net-cost-per-yard. On this railroad contract, near Bensenville, Ill., Raemisch-Madden & McQueen, working on a 60-day time limit, used 12 Tournapulls, completed the 600,000-yard job in 48 working days, despite 18 days of rain in first month.

LETOURNEAU
PEORIA, ILLINOIS • STOCKTON, CALIFORNIA

JOB-PROVED
Over 3500 Built and Shipped

TOURNAPULLS

Job Experience

as the most economical method of moving scraper dirt. Its success has started other manufacturers in this field on the trend to rubber-tired prime movers.

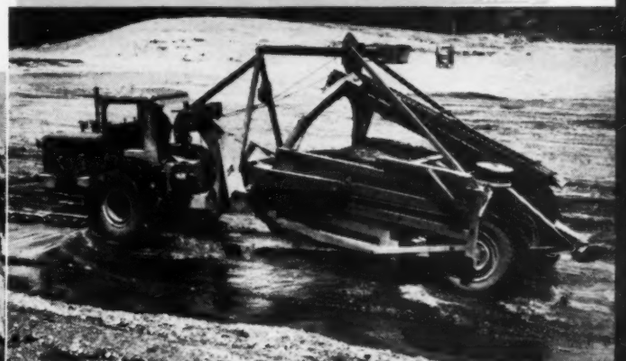
You know this background and also the LeTourneau policy of continual development of dirtmoving equipment and release of improvements as soon as field tests have proved their ability to increase production or lower costs. When you buy Tournapulls you can be sure they will give you lowest unit costs and the biggest profit opportunity of any scraper units available.

GET THE FACTS

Look to LeTourneau now, as always, for leadership in development of dirtmoving equipment that will continue to give you lowest net cost per yard. Keep in touch with your LeTourneau distributor for advance information on Tournapull deliveries. Get his help in planning and estimating your jobs. He has experience and job-proved data that will help you. See him TODAY.

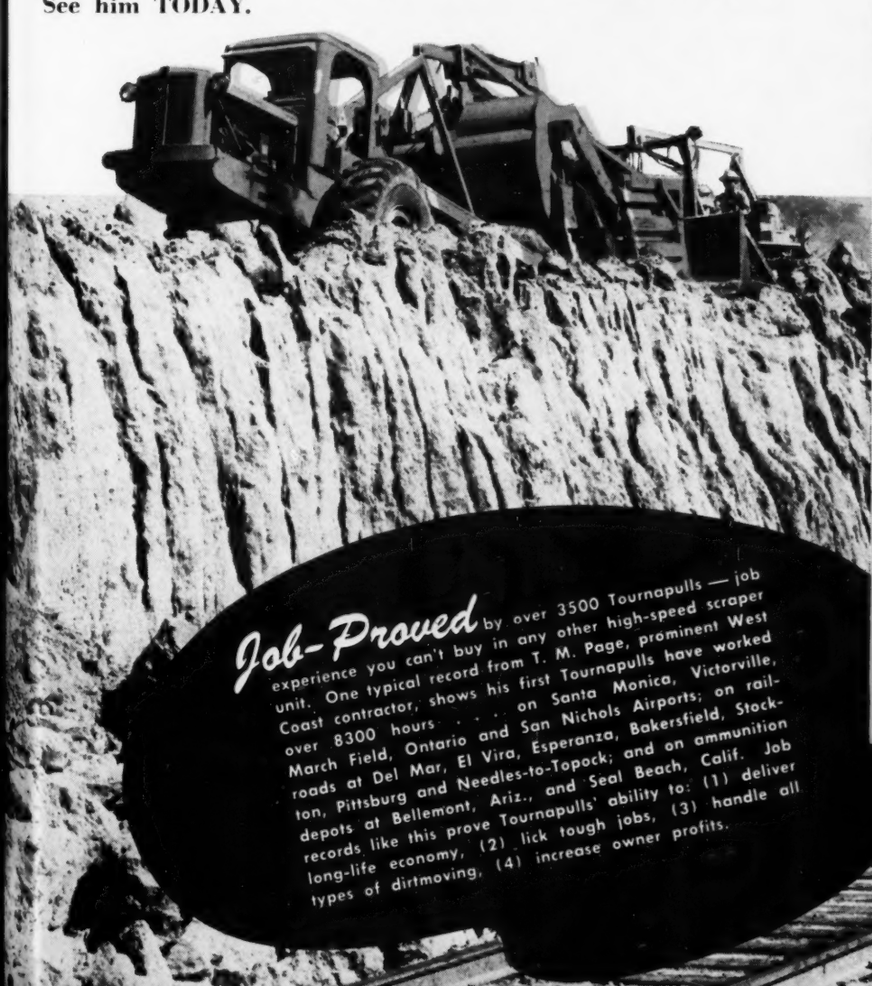
2-WHEEL DESIGN of Tournapull eliminates extra traction-robbing steering wheels. You pull and steer with drive wheels . . . turn faster and sharper . . . "lever" loads up stiff grades or through toughest hauling. Full prime-mover weight, plus 40% of Scraper and load, is concentrated on drive wheels . . . gives you greater traction to pull through loose sand, over bumps, in and out of mud holes. These Tournapull advantages helped lick this tough emergency Illinois River flood-control levee job.

LESS WEIGHT PER H.P. enables you to carry pay load instead of equipment deadweight. The 150 h.p. Tournapull weighs only 31,000 lbs. That's 207 pounds of equipment per h.p. Compare this ratio with any other high-speed, rubber-tired scraper units. You'll find Tournapulls give you 30% more h.p. per pound of weight to move 15 heaped-yard loads on the level, up steeper grades and through tougher going. Successful contractors like A. I. Savin use Tournapulls to move extra pay yards each trip. On Rentschler Airport, E. Hartford, Conn., 5 of these rigs each averaged 55 heaping loads in 10 hours on 1.8-mile round trips.



HIGH AVERAGE SPEED is more important than high-rated m.p.h. A self-propelled scraper can seldom use extremely fast hauling speed. Its performance economy depends rather on a faster all-around cycle of load, haul, spread and return. Tournapulls' extra power with less weight . . . plus proper gear ratios . . . give you faster acceleration to get into high gear quicker . . . stay in high gear longer. Result — *higher average speed, shorter cycle time, more yards per hour.* Working in heavy, wet gravel at Bellows Falls, Vt., contractor Frank Whitcomb's Tournapull gets away from pusher faster, quickly hits 14.9 mph.

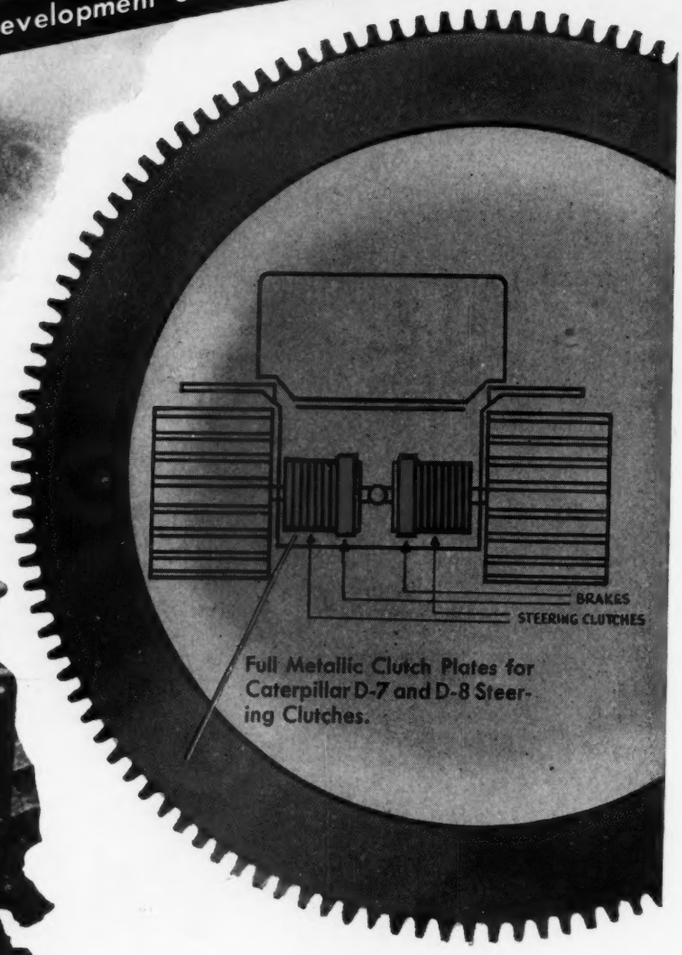
C33



Job-Proved by over 3500 Tournapulls — job experience you can't buy in any other high-speed scraper unit. One typical record from T. M. Page, prominent West Coast contractor, shows his first Tournapulls have worked over 8300 hours . . . on Santa Monica, Victorville, March Field, Ontario and San Nichols Airports; on railroads at Del Mar, El Vira, Esperanza, Bakersfield, Stockton, Pittsburg and Needles-to-Topock; and on ammunition depots at Bellemont, Ariz., and Seal Beach, Calif. Job records like this prove Tournapulls' ability to: (1) deliver long-life economy, (2) lick tough jobs, (3) handle all types of dirtmoving, (4) increase owner profits.

The LEADER must LEAD

Raybestos Leads in the Development of Industrial Friction Materials



Full Metallic Clutch Plates for Caterpillar D-7 and D-8 Steering Clutches.

Raybestos leads with new products, new processes, and a new plant for the manufacture of full-metallic industrial friction materials.

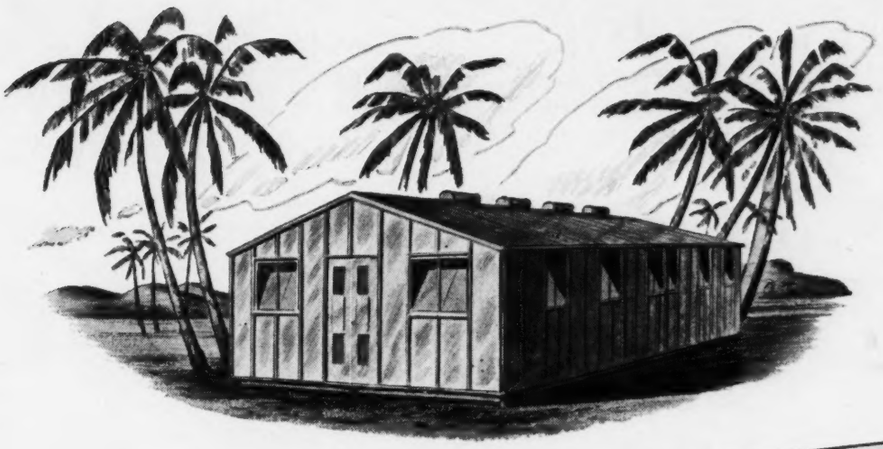
THE RAYBESTOS DIVISION of Raybestos-Manhattan, Inc., BRIDGEPORT, CONN.

Raybestos

INDUSTRIAL FRICTION MATERIALS

BUY ANOTHER BOND

MANUFACTURER of FULL METALLIC, SEMI-METALLIC, WOVEN and MOLDED FRICTION MATERIALS.



44 MILLION POUNDS OF ALCOA ALUMINUM FOR PACIFIC BASES!!

Government Using Aluminum Sheet for Portable Buildings

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"por...me", or a pa...
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Orders have been placed for 44 million pounds of Alcoa Aluminum sheet for roofing and siding on various military buildings in the Pacific area. Alcoa is supplying this sheet to a number of manufacturers making squad shelters, portable barracks and warehouses.

Because of its light weight, workability, resistance to corrosion, and the fact that it requires no painting, Alcoa Aluminum sheet offers great advantages for industrial, residential and farm buildings.

ALUMINUM COMPANY OF AMERICA, 1865 Gulf Building, Pittsburgh 19, Pa.

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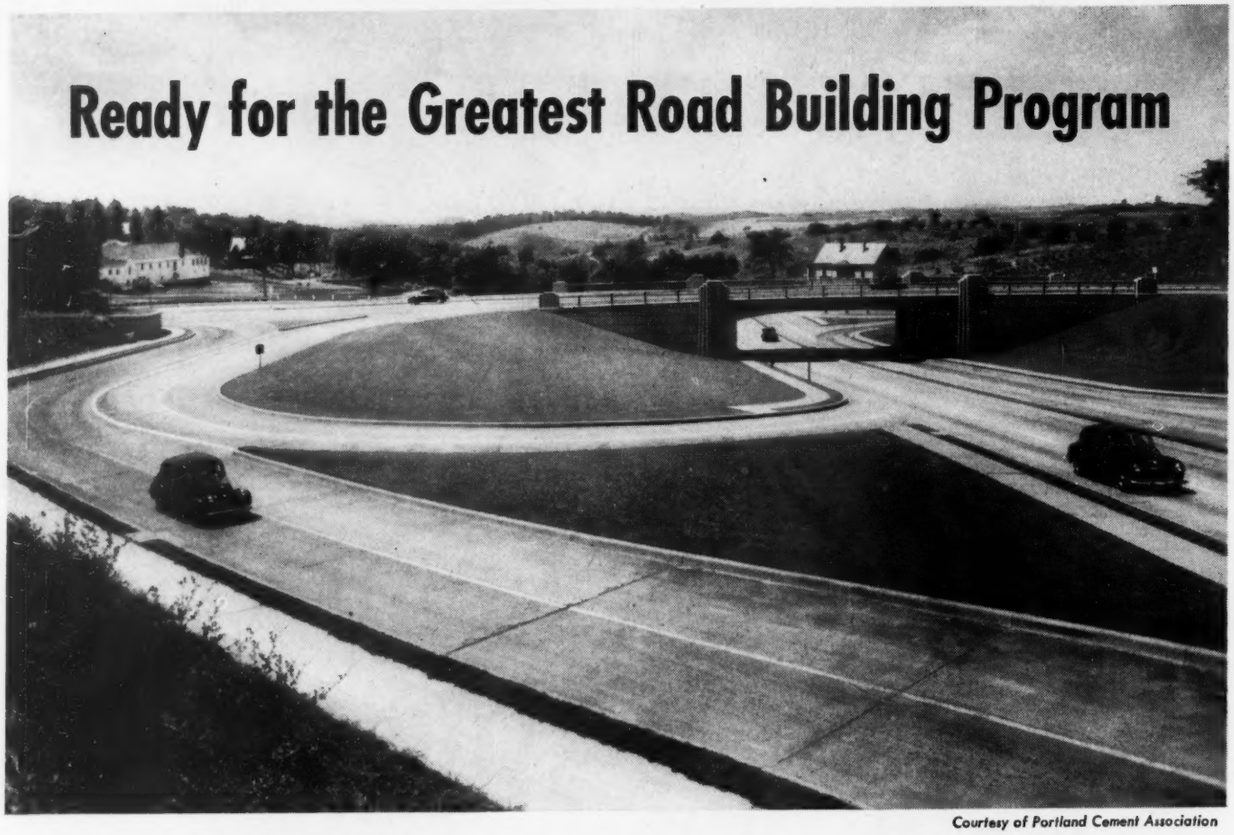
ALCOA ALUMINUM

ALCOA ALUMINUM

Ready for the Greatest Road Building Program



Courtesy of Portland Cement Association

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Bay City
Bucyrus-Erie
Koehring
Lima
Marion
Osgood—The General Excavator Co.
Michigan
Thew Lorain
Trackson
Manitowoc S. B. & D. D. Co.—
Hughes-Keenan (Roustabout)
Insley
Industrial Brownhoist
American Hoist & Derrick
Hanson Clutch & Machinery
Austin-Western
Harnischfeger

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Foote
Hanson
Hetherington & Berner
Jaeger
Koehring
Littleford
Erie
Kwik-Mix
Erie Steel Construction Co.
Barber-Greene
Construction Machinery (Iowa Mixers)
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Caterpillar
W. A. Riddell
Allis Chalmers

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Buckeye
Galion Iron Works

ROAD ROLLERS
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W. A. Riddell Corp.
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LOADERS
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Haiss
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Novo
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Paris

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Leading Makers of Road Building Equipment Use Diamond Roller Chain Drives

When the green light is flashed—America's neglected road-building program will surpass any previous attempts in the history of road construction.

For this tremendous job, the most efficient machinery is ready—excavators, graders, pavers, mixing plants, finishers, loaders, conveyors—earth movers of every description. With over 100,000 man-hours of direct and indirect labor for each $100,000 of road construction, there will be jobs for a great host of men.

On the leading makes of road building equipment, DIAMOND Roller Chain Drives for years have been used regularly. Their endurance and efficiency have been proven on jobs all over the globe. Where you find DIAMOND Drives you will find also modern machinery design and construction.

Diamond engineers are ready to make practical suggestions that will help you speed the completion of your machinery designs.

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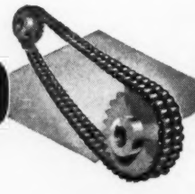
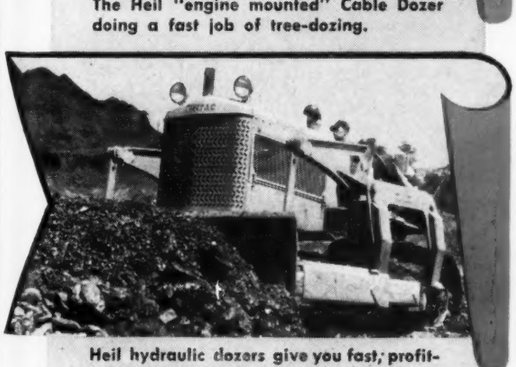
The 96-page book on chain drive data mailed on request. Write for Catalog 617

DIAMOND  **ROLLER CHAINS**

HEIL HI-SPEED Bottom Dump Wagon

The Heil "engine mounted" Cable Dozer doing a fast job of tree-dozing.



Heil hydraulic dozers give you fast, profitable dirt-moving at low cost.

Heil Hi-Speed Cable Scraper is interchangeable with Bottom Dump Wagon—one power unit.

gives you big capacity... a seventeen yard load— and Hi-Speed hauling... up to 27 miles per hour

With the Heil Hi-Speed Trailer Wagon, you cut hauling costs — increase digging output — and reduce maintenance expense. Here's why:

1. Saves loading time — big capacity cuts spotting delays; big open top speeds loading cycle.

2. Cuts hauling time—quick maneuverability with hydraulic power steer; wide tread, low center of gravity, and high hitch point gives stability for safe operation while traveling up to 27 m.p.h.

3. Speeds dumping — power opening doors on clamshell principle give full opening and pull up entirely out of the way while dumping.

4. Turns short and fast — non-stop turning radius 19 feet. High clearance permits turning directly off the windrow.

5. Reduces weather delay — big tires, well-distributed load, a powerful engine, easy maneuverability — keep this wagon going through all kinds of weather.

6. Doubles as a scraper—The 15-yard Heil Hi-Speed Scoop is quickly, easily interchangeable with the dump wagon equipment. By using both scraper and dump wagon, with one power unit, you save capital investment, increase your job capacity, and fit your equipment to lowest cost operation on any dirt moving job.

ARMY E NAVY

SEE YOUR HEIL DISTRIBUTOR

R-52

THE HEIL CO.

GENERAL OFFICES • MILWAUKEE 1, WISCONSIN

Protect Your Equipment by Switching Now to the Extra Safety of ALEMITE Winter Lubricants

● Your equipment has just finished a "rugged" summer. Now—your toughest winter's ahead. You've *got* to keep it running despite hard-to-get repair parts and murderous schedules. So play safe! Protect your precious, irreplaceable equipment by switching *now* to the extra safety of Alemite *Winter* Lubricants. They offer you *exclusive* advantages not found in cheap greases. Advantages that pay off in lowered maintenance and increased production!

ALEMITE GEAR LUBRICANTS

Risking gears this winter means risking whole machines and your business. Alemite *Winter* Gear Lubricants withstand extreme cold and pressures and still protect hard-working surfaces regardless of conditions. Change now and save a machine.

ALEMITE WINTER MOTOR OIL

Around the clock operation wears out ordinary oil fast. Zero weather increases the risk. Alemite Winter Motor Oil and Diesel Oil will stand up under the severest operating conditions. Available in all S. A. E. winter grades.

ALEMITE "Sub-Zero" LUBRICANT

Guard vital bearings against cold-weather friction with Alemite Sub-Zero Lubricant. Unlike ordinary grease which actually creates friction in cold weather, Alemite Sub-Zero Lubricant stays on the job at temperatures down to 40° below! Switch now and save a machine!

ALEMITE No. 33 LUBRICANT

Exclusive with Alemite! Developed to provide a working temperature range from 25° below to 205° F. Ideal for equipment where bearing loads are high and resistance to rain and muck is vital. Won't clog grease guns or bearing grooves. This *exclusive* Alemite lubricant lasts longer, too!

Call in the Alemite Lubrication Specialist to explain "on-the-job" power lubrication for complete winter protection of machines. Write for his name to, Alemite, 1840 Diversey Parkway, Chicago 14, Illinois, or Belleville, Ontario.

ALEMITE

First in Modern Lubrication

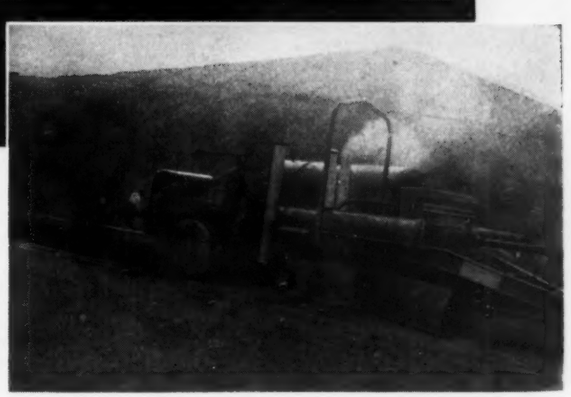
Another Product of STEWART WARNER

LUBRICANTS • EQUIPMENT • MAINTENANCE • ENGINEERING • CONSULTATION

Are You Bidding This Kind of Work?

ROAD MIX SURFACING
MIX-IN-PLACE ASPHALT BASE
SOIL CEMENT BASE
FLEXIBLE BASE
ANY TYPE OF STABILIZED BASE

If You Are, You Need a WOOD ROADMIXER



Here's why: (1) Your cost per square yard or cost per ton is less than when using any other method.

(2) It produces as much as 250 tons per hour of ready-to-spread mix.

(3) It needs only a tractor and supply truck as auxiliary equipment, both of which can be used for other work when Roadmixer is not in use.

(4) Two men can handle average job.

(5) It costs less to own, operate and maintain than any similar equipment on the market.

(6) It has a 12-year record of successful, economical, long-life construction throughout the world.

Wood Roadmixers are now available without priority. See your nearest distributor or write direct for literature and prices.

ROADBUILDING EQUIPMENT

WOOD MANUFACTURING CO.

816 WEST FIFTH ST. LOS ANGELES 13, CALIF.

Compressed Air...

EVERY TIME THE BUTTON IS PUSHED!

All you have to do is push a button . . . and get all the air you need with a Schramm Air Compressor!

This is a feature worth having in an air compressor. In addition, Schramms are lightweight, easy to move about, and are 100 per cent watercooled to provide ideal performance both summer and winter.

Four Schramms were used on the road construction job illustrated above. It is only one of many jobs where Schramm was specified to do the job. Air obtained easily . . . constantly . . . that's what makes your construction job easier. If you use compressed air, it will pay you to write for descriptive literature and details.

SCHRAMM INC.

THE COMPRESSOR PEOPLE
WEST CHESTER
PENNSYLVANIA

"Armstrongs are long on *performance*"

R. L. VILLENEUVE, Pres.
Victory Coach Lines
Chicago, Ill.

● "Operating our coaches to keep abreast of war-time travel needs has meant making every tire mile count. Each tire we purchase must pay its way—and we demand long wear, safe, trouble-free service, and low operating cost. I have found that when it comes to such a test and the chips are down—Armstrongs are long on performance!"

SINCE 1912 hundreds of commercial car operators have discovered that *you can't buy a better tire than an Armstrong!* Our pioneering efforts in making tires that wear longer and cost less have brought great savings to the buyer.

From the modern Armstrong Research Laboratories will come post-war products with new features to serve you better at lower cost. You may be sure—if it's an Armstrong Tire, it's *one of the best!*

For literature or information write your Armstrong distributor or to Armstrong Rubber Company.

ARMSTRONG TIRES

Manufacturers of Quality Tires and Tubes Since 1912 · General Offices and Plant—460 Elm Street, West Haven 16, Conn.

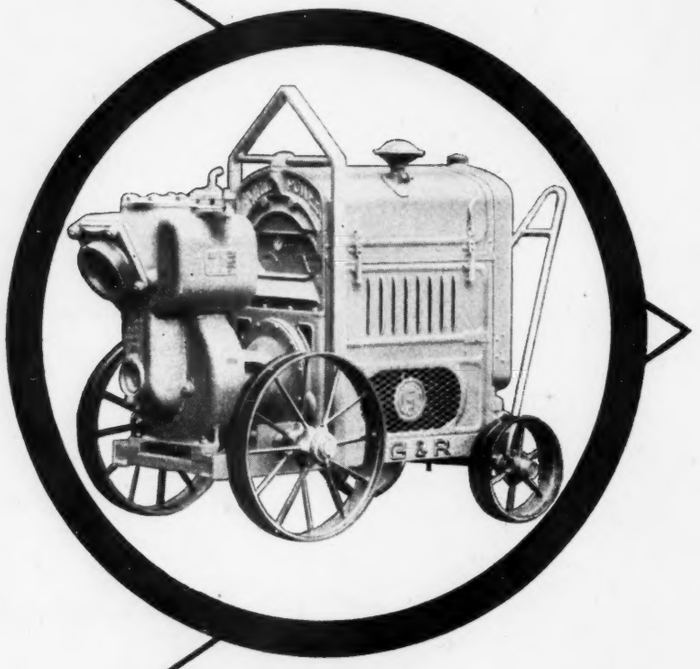
you can't lose on this proposition

IT WON'T COST YOU A CENT TO LEARN THAT GORMAN-RUPP PUMPS ARE YOUR BEST BUY

Fast talking may sell you some other make of de-watering pump. But once on the job the pump must do its own talking – by performance.

When the going is tough – the water is filled with mud and corruption – see how many other pumps can stomach it like a Gorman-Rupp Contractor's BLUE Pump.

Streamlining the outside of a pump doesn't help it pump more hours or more water per gallon of gasoline. Streamlining the inside is what counts.



Ask what you want of a Gorman-Rupp pump. Run it months at a time, without let-up. Give it any kind of test. You will see that no other pump will do the work of a Gorman-Rupp!

For size of pump, for power consumed, for dollar of investment, Gorman-Rupp pumps will out-perform any other and we are willing to let you prove this to yourself by a free trial with no strings attached. For details, call your nearest distributor.

GORMAN-RUPP PUMPS — UNSURPASSED FOR PUMPING FAST — ARMY NAVY

THE GORMAN-RUPP COMPANY

M A N S F I E L D • O H I O

MORE MILES

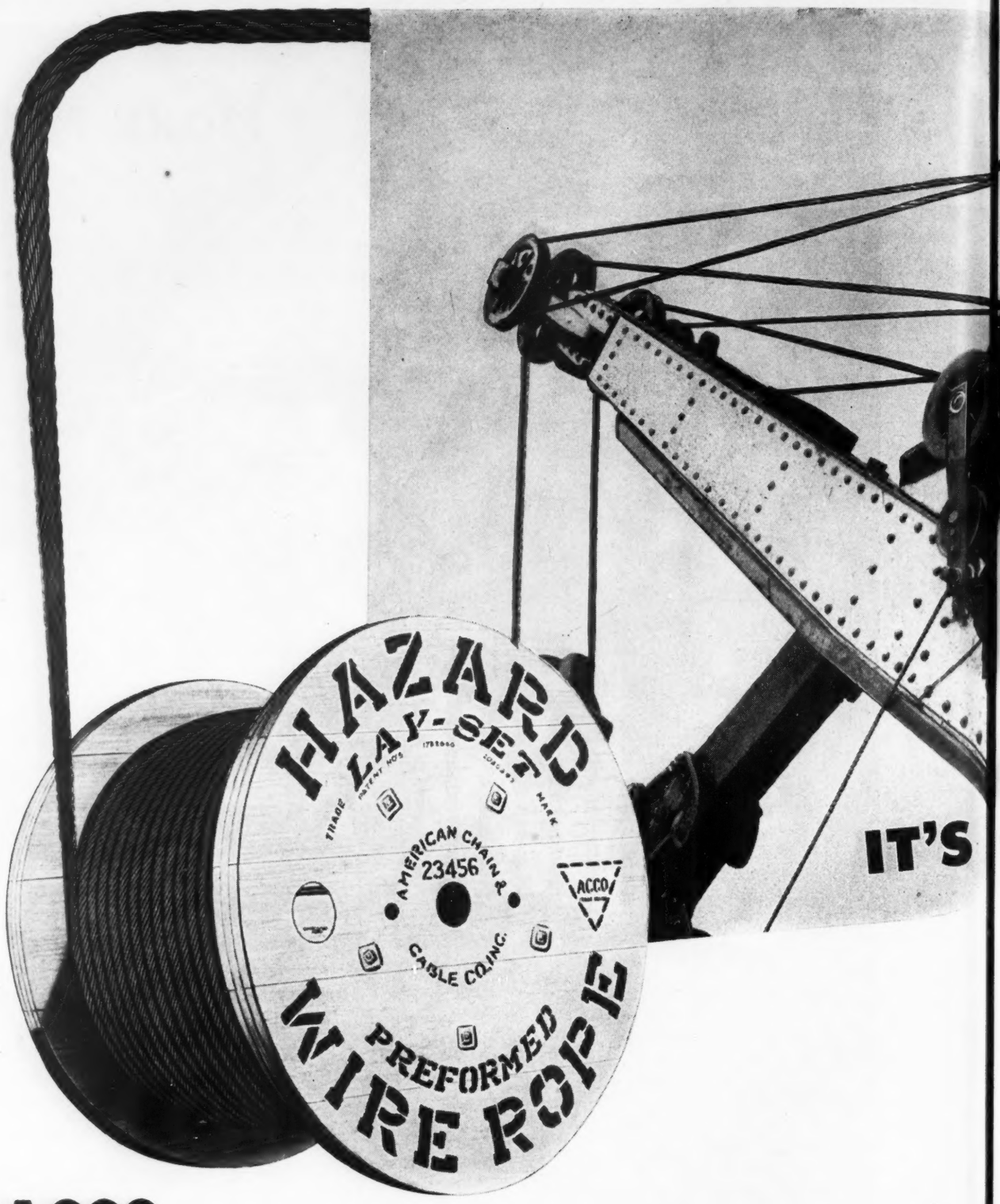
PER Galion

Motor Graders that take the hardest jobs in road and airport construction in stride . . . built to do the job right—built to last. Look at the big No. 101 motor grader above—it should have a definite place in your plans for the future. Galion rollers also should enter into your program if you desire precise compaction with dependable machines. We'll be glad to tell you more about Galion Road Machinery and what it can do for you. Send for our latest catalogs.

THE GALION IRON WORKS & MFG. CO.

Main Office and Works: GALION, OHIO

DISTRIBUTORS IN MOST LARGE CITIES



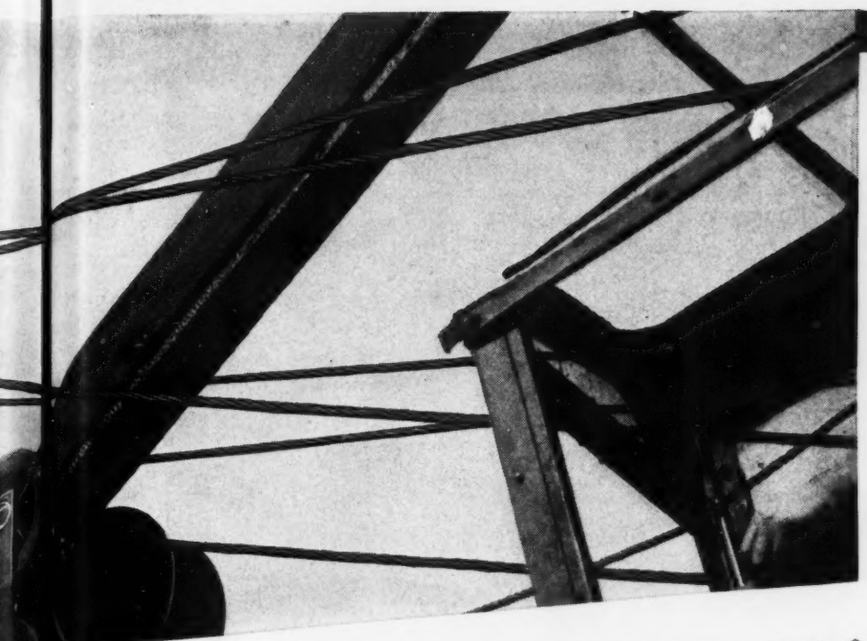
ACCO

Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, Portland, San Francisco, Tacoma, Bridgeport, Conn

HAZARD WIRE ROPE DIVISION
AMERICAN CHAIN & CABLE

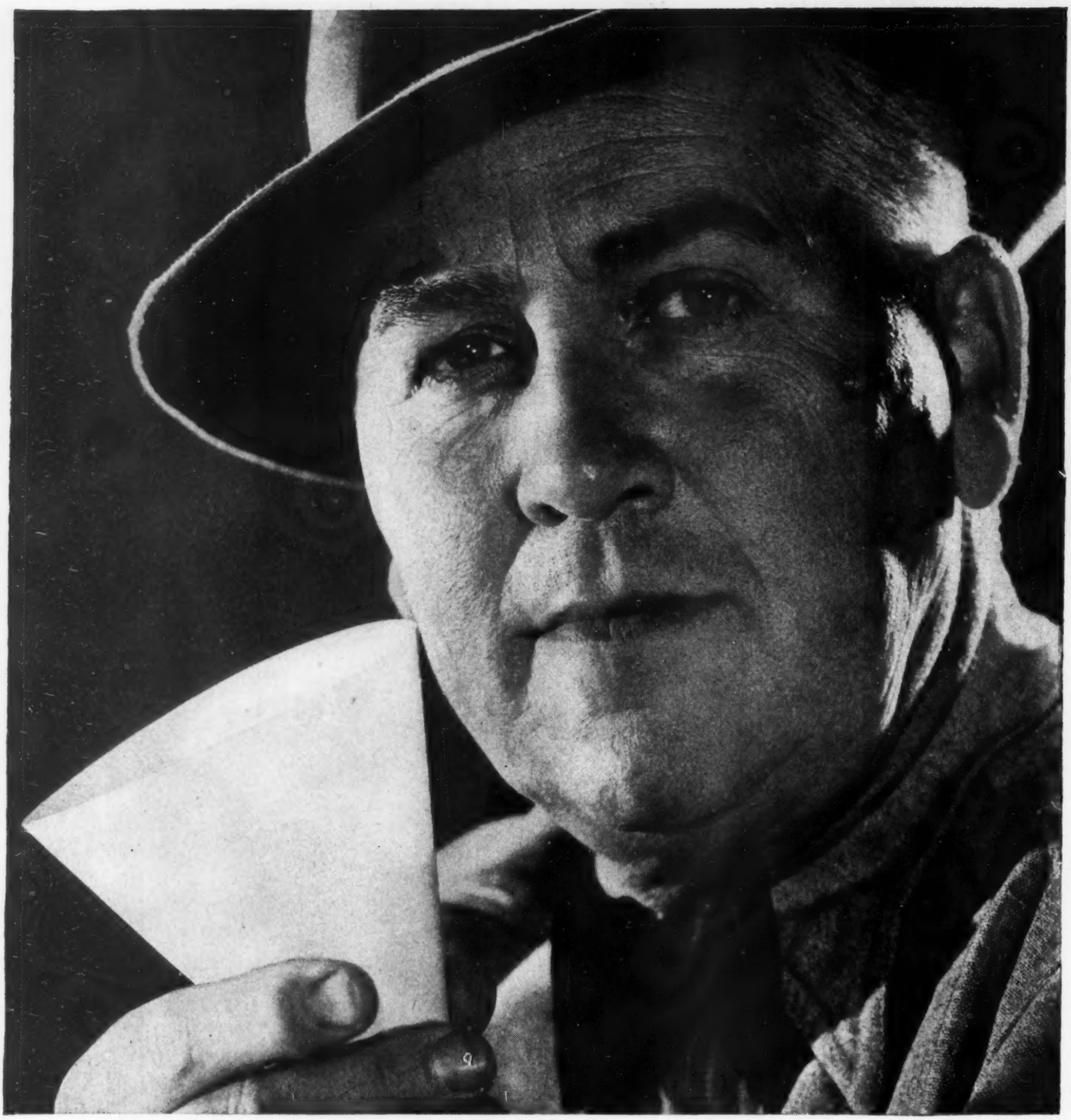
ACCO
TRADE MARK

In Business for Your Safety



IT'S ALL GREEN NOW
IT'S BETTER THAN EVER
LAY·SET PREFORMED I.P.S.*

● **LAY·SET** Preformed Improved Plow Steel* has always been Hazard's highest quality rope. Now it is better than ever, because every strand is packed with GREEN-LUBE –a superior, more adherent lubricant. This All-Green **LAY·SET** Preformed will last longer, give better service. GREEN-LUBE is a more costly lubricant—but not to you. It is Hazard's assurance that when you specify **LAY·SET** Preformed Improved Plow Steel you ask for the best there is in wire rope.



"one way to keep men working...
reduce absenteeism...is with VORTEX CUPS"

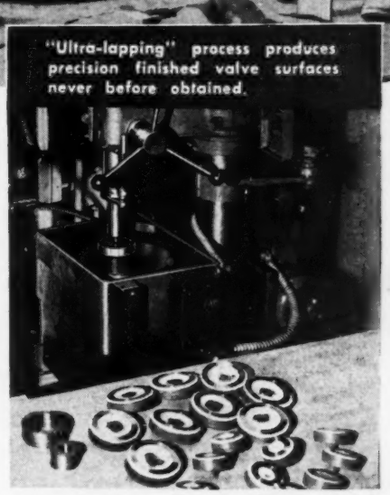
DIXIE'S PORTABLE WATER CARRIER

Your best bet for checking the spread of colds and other mouth-borne infections—common cause of absenteeism—is individual drinking cups. The Dixie Portable Water Carrier brings individual Dixie and Vortex Cups and cool, clean water right to the men. It helps keep them on the job—helps maintain construction schedules. *Write for descriptive folder.*

DIXIE CUPS, VORTEX CUPS AND PAC-KUP CONTAINERS ARE MADE AT EASTON, PA., CHICAGO, ILL., DARLINGTON, S. C., TORONTO, CANADA

AIR PLUS JAEGER COMPRESSOR

Any Jaeger Compressor will hold air above 90 lbs. pressure for 20 to 25 minutes *(5 to 10 times longer than others)* THAT'S PROOF YOUR TOOLS ARE GETTING ALL THE AIR!

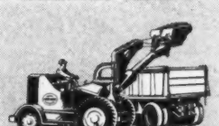


"Ultra-lapping" process produces precision finished valve surfaces never before obtained.

You've got to hold air in order to deliver it. Because they're individually "ultra-lapped" (an exclusive process) Jaeger "Tough Swedish Twin" valves have perfect leak-proof closure —5 to 10 times more effective than the best ordinary valves— one of the reasons why "AIR PLUS" compressors deliver more air, more efficiently, at slower piston speeds and the lowest known cost in fuel. Ask for Catalog JC-5. It describes the most advanced line of air compressors in America—sizes 60 to 500 ft.

THE JAEGER MACHINE CO., Columbus 16, Ohio.

REGIONAL OFFICES:	8 E. 48th St. NEW YORK 17, N. Y.	226 N. LaSalle St. CHICAGO 1, ILL.	235-38 Martin Bldg. BIRMINGHAM 1, ALA.



"FLEET-FOOT" Loaders

"SPEEDLINE" Concrete Mixers

"SURE PRIME" Contractors Pumps

JAEGER *Engineered* EQUIPMENT

*JAEGER-LAKEWOOD SPREADERS, FINISHERS AND BITUMINOUS PAVERS, FORMS, FORM TAMPERS—"DUAL-MIX" TRUCK MIXERS, AGITATORS—JAEGER HOISTING ENGINES, TOWERS

"Boom Guard" Shock Absorber

UNTWISTS ROCK HANDLING STRESSES

YOU CAN'T JAR THE 605 BOOM!

Because the Koehring "Boom-Guard" Shock Absorber takes the jar out of rock shock loading. Heavy coil springs ride out twisting strains of "sweeping up," cushion bending strains when the dipper hits a tough spot in the cut, absorb all the stresses that injure unprotected booms or dipper sticks.

WHY A SHOCK ABSORBER?

Why a shock absorber on a boom that's already plenty strong? Because there may be times, particularly in rock, when even the toughest boom takes it on the chin. That's why it's smart to buy the Koehring 605 with the boom that's shock absorber protected.

BOOM REMAINS RIGID!

Because the Koehring 605 "Boom-Guard" Shock Absorber is correctly spring-loaded, you sacrifice not a bit of the rigidity you want for perfect control. No spring, no bounce, no sway, but full protection when you need it.

KOEHRING COMPANY • MILWAUKEE 10, WIS.

KOEHRING **605**

ASK FOR YOUR 605 CATALOG TODAY

ARMY (E) NAVY

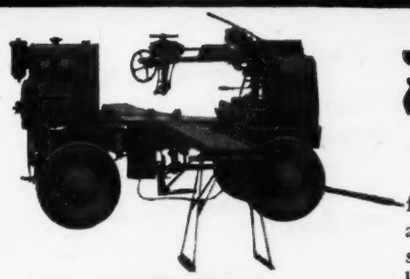
KOEHRING K HEAVY DUTY

HEAVY-DUTY CONSTRUCTION EQUIPMENT

idle crawlers earn no money

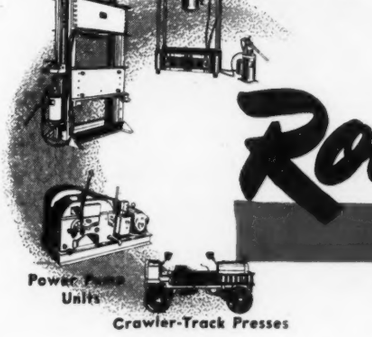
...here's the way to whip them back in service

with amazing savings in time and labor!



MR. CONTRACTOR . . .

Your dealer probably has Rodgers Track Servicing Presses in his service department for the purpose of helping you maintain your equipment. If he hasn't and your requirements won't justify your having a Rodgers Press of your own, urge him to investigate the savings of a Rodgers. It will pay you both!



Rodgers crawler track Presses

IT'S A WASTE OF TIME to lay up crawler-tractors a couple of days for routine track maintenance—it's unnecessary to slug the pins and tug or burn stubborn nuts. A Rodgers Track Press does the track service job . . . so easily . . . so fast. It takes just an average 3 or 4 hours machine time to service two large strings of track—and you can do it on the job with a *Portable Rodgers*.

An exclusive Rodgers feature is the Retractable Jaw which eliminates lifting the track over a stationary jaw and assures proper bearing support against the inner side of the rail, thus properly spacing the rails, eliminating any binding action—leaves tracks flexible after servicing. The Rodgers Track Wrench is the handy answer to tight, frozen nuts.

You can get a Rodgers Crawler-Track Press in portable models: 2 wheel trailer or 4 wheels; and in stationary shop models. *Write now* for complete details; or see your crawler equipment dealer—he will tell you what a Rodgers can do to save you time and labor.

Rodgers Hydraulic, Inc.

hydraulic power equipment

HYDRAULICS Rodgers KEEPING WORLD MOVING

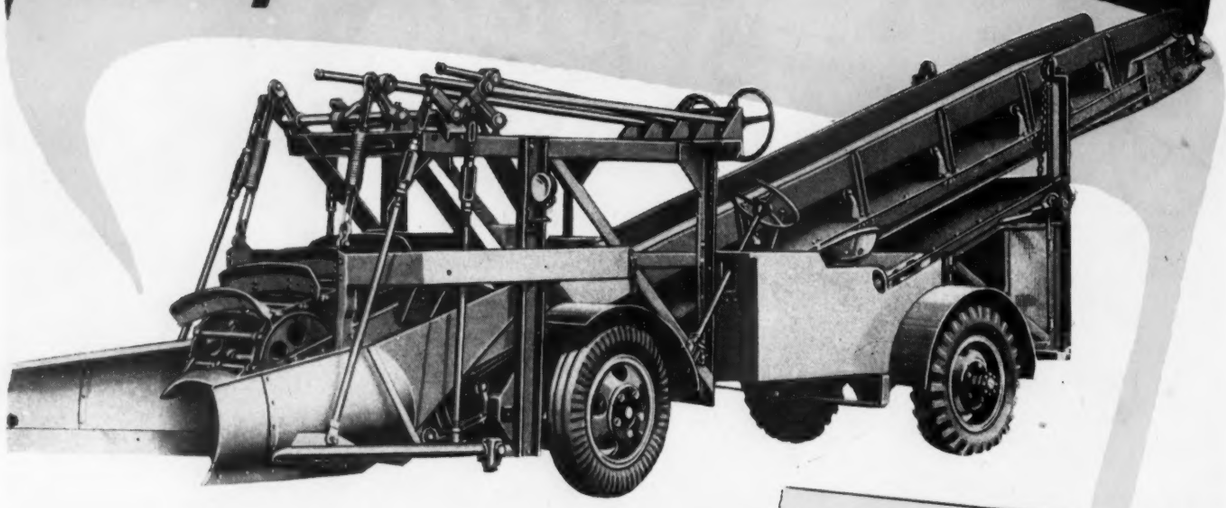
7403 Walker St., St. Louis Park, Minneapolis 16, Minn.

HIGHWAY ENGINEERS ACCLAIM

MANY *War-Time* USES OF

★

Athey FORCE-FEED LOADER



Here's What They're Saying

"Just the tool we've wanted."

"Speeds every one of our loading jobs."

"There's nothing else like it."

"Simplifies our highway maintenance problems."

"It's a lifesaver these busy war days."

"Keeps our roads better maintained than ever before."

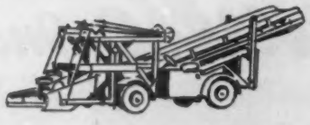
Busy highway departments are turning away from hand and other obsolete, costly loading methods . . . finding the modern, Athey Force-Feed Loader a versatile piece of equipment for many wartime maintenance jobs.

Operating as a companion tool with your "Caterpillar" Motor Grader, the Athey Force-Feed Loader is a self-propelled, one-man operated outfit designed to help solve your manpower problems and speed the removal and salvage of surplus material on highway maintenance and construction.

You'll find the Athey Force-Feed Loader an economical, fast, clean tool for handling surplus material in ditch cleaning, road widening and straightening, slope trimming, road grading, building and relocating ditches, salvaging topsoil, and loading oil mix.

Investigate the Athey Force-Feed Loader for your highway maintenance work. See your Athey-"Caterpillar" dealer today, or write direct to Athey Truss Wheel Co., 5631 West 65th Street, Chicago 38, Illinois.

Athey



FORCE-FEED LOADER

FORGED-TRAK TRAILERS

MOBILOADERS

DEPENDABLE LOADING & HAULING EQUIPMENT

Cost-Cutters on Any Job Anywhere

FIRESTONE Off-the-Highway Tires cut operating costs because they keep right on rolling after other tires have taken the final count. Contractors have proven this on every kind of job everywhere.

They stand up under terrific punishment because of the materials and workmanship that Firestone puts into their construction. Bodies are made of the strongest rayon cord, Gum-Dipped for extra life. There are four extra plies to take impact blows. Sidewalls are double thick — an extra safeguard against rutwear and snags. The tread is strong, tough, cut-resistant.

These are the reasons why Firestone tires will cut your operating costs and increase your profits. They are built to *do* the job — and to *stay* on the job.

For the best in music, listen to the "Voice of Firestone" every Monday evening over NBC network.

Copyright, 1945, The Firestone Tire & Rubber Co.

"Caterpillar" Diesel D8 Tractors pull scrapers on medium hauls in building the mountain-top Kanawha Airport

NEAR Charleston, West Virginia, heart of the Kanawha chemical and industrial empire, a remarkable airport is being built. There's no level ground in the region — nothing but rough sandstone hills and narrow, steep-sided valleys. But by slicing the tops off four adjacent mountains, and filling the valleys between, they're building a huge, modern airport with runways 6000 feet long!

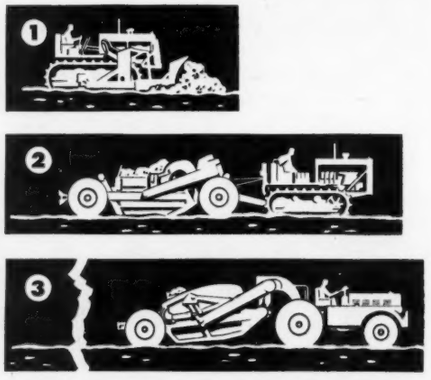
Today some 60 "Caterpillar" Diesel Tractors—track-type and wheel—are busy moving these mountains. Husky D8's are slashing through earth and rock with their bulldozers and tumbling the hilltops into fills as deep as 230 feet.

On the medium hauls, the same sturdy track-type tractors are pulling 25-yard scrapers to the fill. And on the longer hauls of half a mile or more, where road-speed is important, "Caterpillar" Diesel DW10 Tractors, rolling on rubber, take the earth away in "Caterpillar" W10 Wagons. The whole mountain-moving operation is a graphic example of *zoned equipment*, effectively used on a contract totaling over 5,000,000 yards.

Also on this job, three "Caterpillar" Diesel Motor Graders are constructing haul roads and runways; and nine "Caterpillar" Diesel D13000 Engines are powering shovels and compressors.

The Harrison Construction Co., contractors on the airport, have had a great deal of experience with "Caterpillar" Diesels, moving more than 32,000,000 yards of earth in the past four years. Says L. S. Wescott, Asst. Chief Engineer: "On our jobs, temperatures have ranged from 110° in the shade to 40° below zero. Mud has been knee-deep and dust almost as thick. Completely equipped repair shops have been non-existent, and, in spite of these conditions, field-repaired 'Caterpillar' equipment has stayed on the job, working night and day."

CATERPILLAR TRACTOR CO., PEORIA, ILL.



Zone Your Equipment for Lowest Costs on Earth

1 *Track-type tractors, with bulldozers and rippers.*

2 *Track-type tractors for loading and pulling scrapers.*

3 *Wheel-type tractors for high-speed hauls*

CATERPILLAR
REG. U.S. PAT. OFF.
DIESEL ENGINES • TRACTORS • MOTOR GRADERS • EARTHMOVING EQUIPMENT

The discharged veteran wears this emblem. Remember his service and honor him.

PLAN FOR BETTER EQUIPMENT, TOO!

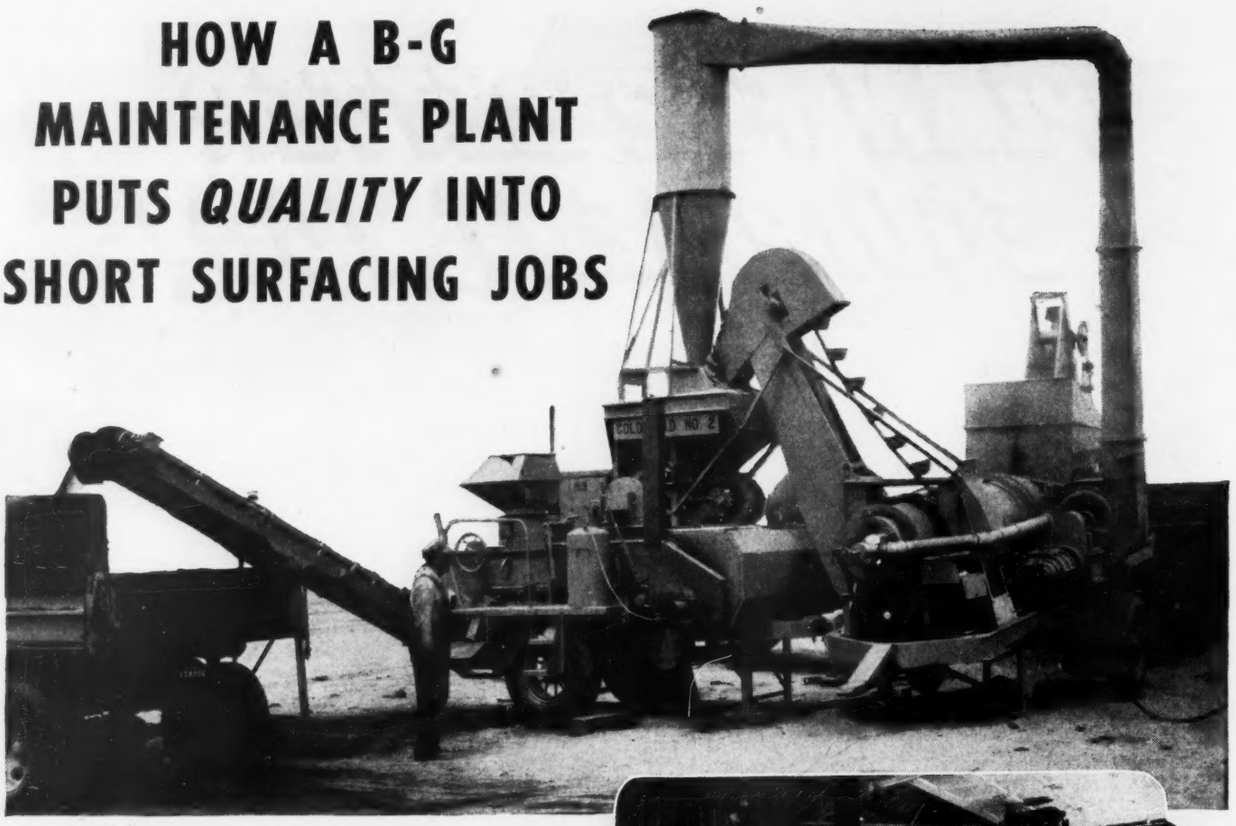
Big 2½ yard T7 TRAXCAVATOR grading new street in San Francisco

Loading sand at Portland, Maine . . . one of many tasks for this city's TRAXCAVATOR

T4 TRAXCAVATOR loading excess dirt from shoulders on an Indiana road job

WHEN the "go-ahead" signal is given, your well-planned construction projects will get off to a flying start if you have planned to "TRAXCAVATE" — for it's the modern earth-moving and material-handling method. TRAXCAVATORS, the dependable tractor excavators, combine in one machine the usefulness of a shovel, loader, scraper, bulldozer, anglegrader, etc. There's a size for every job and purpose. Your TRACKSON-"Caterpillar" dealer will be glad to give you the complete and revealing story, or write to the TRACKSON COMPANY, Dept. CM-95, Milwaukee 1, Wisconsin.

HOW A B-G MAINTENANCE PLANT PUTS *QUALITY* INTO SHORT SURFACING JOBS



A B-G Portable Maintenance Plant with Dust Collector.

You get the same proportioning, mixing and drying control with this Barber-Greene Maintenance Mixer and Companion Dryer that has made the B-G Heavy Duty Asphalt Plant famous the country over for its accuracy and homogeneity of mix.

With the B-G Maintenance Plant you can economically produce the highest quality bituminous mix for short street and highway jobs, for patching, and for surfacing driveways, parking lots and other small areas.

Dryer and mixer are self-contained mobile units, quickly uncoupled and trailed from one location to another. Speedy, easy erection reduces unproductive hours when changing sites . . . steps up monthly tonnages . . . requires a minimum maintenance crew.

Add up the advantages of the B-G Maintenance Plant with its "continuous flow" capacity of 15 to 30 tons an hour . . . its thoroughly controlled mixing . . . its extreme portability and flexibility, and you'll find where huge savings are effected in time and money over the years in patching, putting down short stretches and handling small blacktop paving jobs. Barber-Greene Company, Aurora, Illinois.

Where a permanent set-up is desired, equipment is furnished without running gear. Mixer can be used as separate unit when desired. Plant produces all types of bituminous material—hot, cold, sand, sheet, powdered and emulsion mixtures.

ARMY E NAVY

45-12

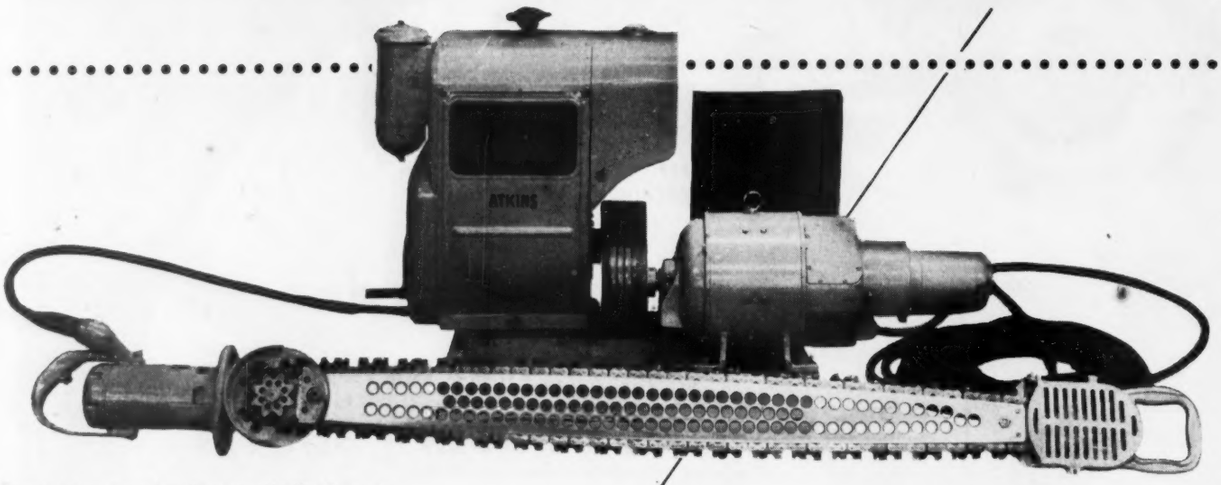
Barber-Greene B G *Constant Flow Equipment*

They're necessitated by the fact that we're currently faced with the problem of fulfilling our "roller obligations" to the armed services and getting production under way on the limited number of Maintainers and Rollers we've received permission to manufacture for civilian use. As a consequence, we haven't found time to get out into the field and photograph our 1945 models at work. Users report, however, that these new Hubers are even better performers than their predecessors. And that's saying something!

THE HUBER MFG. COMPANY • MARION, OHIO, U. S. A.

HUBER ROLLERS

ATKINS *Chain Saw*



Typical Atkins Chain Saw "Package Unit" with an air-cooled gas engine and generator mounted for use on trailer, truck or tractor. The saw can be operated up to 1000 feet from the generator unit by means of cable.

To Speed Up Your HEAVY-DUTY SAWING

The Quick, Efficient Way of Sawing Heavy Timbers, Planking, Etc.

Atkins Chain Saw can help you streamline another phase of your operations. This is your heavy-duty sawing—big timbers, heavy planking, piling, logs, etc.

Because Atkins Chain Saw does such sawing *mechanically*, your men can handle these tough jobs in a fraction of the time and without the back-aches and hard labor needed for manual sawing. The result: lower costs on sawing jobs and a real "break" for workers.

Atkins Chain Saw is light in weight and easy to handle. And because it's electrically powered, it operates dependably under virtually all climatic conditions.

Yes, put Atkins Chain Saw down as another important Atkins contribution in the field of saws and cutting tools. Write for Atkins Chain Saw Bulletin today.

Atkins Has the RIGHT SAW for Every Job

No matter what the job, Atkins has the specific type of saw to help you do it faster. The Atkins line includes Docking Saws, Hand Saws, One-Man and Two-Man Crosscut Saws, Circular Saws for portable power saws, Hack Saw Blades, etc.

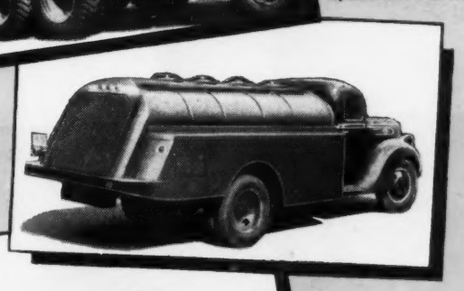
ATKINS

E. C. ATKINS AND COMPANY • 485 South Illinois Street, Indianapolis 9, Indiana

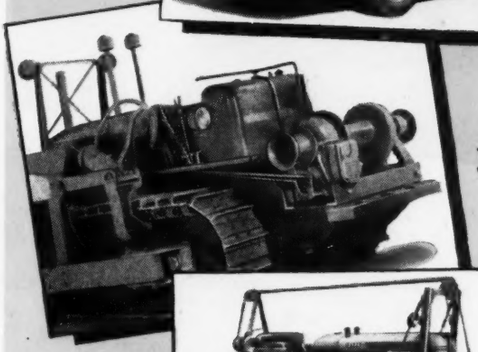
Agents or Dealers in All Principal Cities the World Over

West Coast Special, W-12 Body and FBC cam and roller Hoist mounted on semi-trailer.

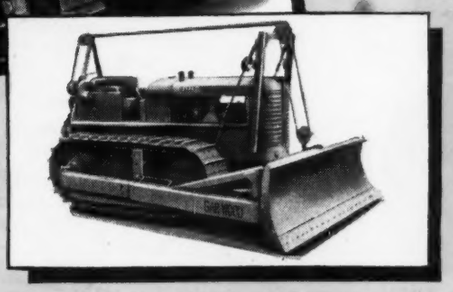
Semi-Rock Body with special rib reinforcement and open end. Cap. 13 cu. yds. Dual hydraulic T-440 Hoists



Gasoline or Fuel Oil Tank T-2174, one of a large and diversified line.



Tractor or utility winches.



Cable Dozecasters with angling blade for Allis-Chalmers HD-10 and HD-14 Tractors.

Designed to give TOP-NOTCH PERFORMANCE

Gar Wood Equipment Does a BETTER Job for You.

Some people just work. Others have the ability to rise above the crowd . . . to distinguish themselves by doing better-than-average work. The same comparison can be made in mechanical equipment. Gar Wood Products have a reputation for top-notch service . . . better-than-average performance. That quality didn't just happen. It's the result of years and years of experience in designing equipment to do a specific job in the best possible way. Gar Wood products cover a wide field of uses and in each case you can be sure of one thing . . . they rise above the crowd. Take advantage of Gar Wood top-notch performance when planning your equipment needs.

BUY MORE BONDS . . . AND KEEP 'EM

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HOISTS AND BODIES • WINCHES AND CRANES • TANKS • ROAD MACHINERY • HEATING EQUIPMENT • MOTOR BOATS

MAKES IT READY FOR ANY JOB...

Arcontrol! The control that lets the operator fit the arc to the job—gives him a choice of three types of arc—makes his job easier—welds better. "Normal" range gives fast, flexible operation that meets average conditions. "A" and "B" ranges, like second and low gear, provide reserve ranges of power when the going is tough.

And with the Flexarc, you not only fit the arc to the job, but preset the current before you start welding. There will be no drop in welding current after the machine warms up—no need to stop work and readjust the setting. The arc is right and the current holds.

Add to these two exclusive advantages, the rugged construction of the Flexarc welder and you have three good reasons for specifying Flexarc. It's the "armor-covered" welder with all vital parts enclosed in a one-piece, heavy seamless-steel frame. It's built tough. You can treat it rough. For more complete information ask for Descriptive Data 26-100-1, or write: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-21335

ARC CONTROL		
NORMAL	A	B
LIGHT GAGE DOWNHAND LARGE ELECTRODES	OVERHEAD & VERTICAL DEEP GROOVE SHORT ARC	OVERHEAD & VERTICAL DEEP GROOVE EXTREMELY SHORT ARC

38160-A

SOLID STEEL FRAME

In addition to its simplicity of control and sturdy frame, Flexarc offers these plus features that mean better performance and lower maintenance:

Thermoguard protects motor against burnout.

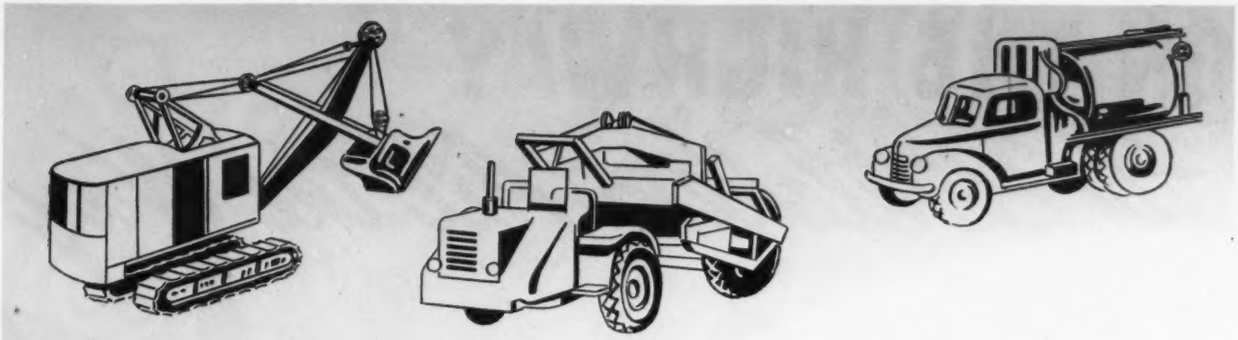
Sealed-for-Life Ball Bearings keep grease in, dust out.

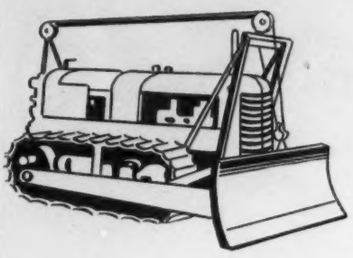
Double End Ventilation with new quiet fan.

Motor Stator doubly protected—taped end turns—2 dips and bakes in moisture-resistant varnish.

Brushholders easily accessible, noncorrosive.

Westinghouse FLEXARC WELDERS





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MANY OTHER
TYPES OF
EQUIPMENT

MONEY

WITH WHICH TO BUY

Construction Equipment

CONTRACTORS—would you like to buy construction machinery and equipment without tying up your working capital? On a basis that permits you to pay for it over extended periods? Here's how it's done!

The C.I.T. Construction Equipment Plan provides...

CASH—with which to make the purchase

TERMS—which enable you to amortize the cost through monthly instalments

PROMPT ACTION—a minimum of negotiation

REASONABLE COST—whether purchase is large or small

DISTRIBUTORS

C.I.T. OFFERS YOU a complete Financing Plan that includes:

A retail sales financing plan that helps you sell more equipment.

*

Wholesale accommodation that supplies the funds with which to buy and carry new and used equipment.

*

Send for a copy of our Distributors Construction Equipment Financing Plan.

Get the details of this plan from your distributor or our nearest office. Let C.I.T. Financing pave the way for more equipment—more jobs—more profits. Write, wire or 'phone.

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ON THE HIGHWAY

it's Bethlehem All the Way

REINFORCING STEEL—Bethlehem Reinforcing Bars, plain and deformed, are made in all standard sizes and grades, of new-billet steel. Most Bethlehem warehouses can bend bars to shape and cut them to specified lengths.

Bethlehem Welded Wire Fabric conforms with A.S.T.M. specification A-185-37, and is readily installed and gives reliable service. Made to meet all standard specifications.

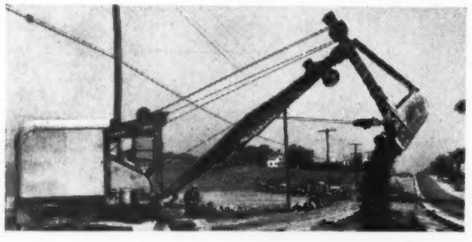
GUARDS AND POSTS—Standard Bethlehem ¾-in., 3-strand highway guard is made of tough, durable, double-galvanized Bethlehem steel cable. Bethlehem's beam-type guard rail, called the Safety-Beam, (shown above) is made in standard lengths of 12 ft., 6 in.—or can be supplied in lengths up to 50 ft.

Properly-driven, Bethlehem Steel Highway Guard Posts have a resistance to impact or side-thrust equal or superior to that of wood posts. The Bethlehem Highway Guard Bracket, made of high-tension spring steel, can be economically applied to guard posts of either steel or wood, even if already standing.

Where highway steel products are concerned, Bethlehem will go along with you, all the way down the line. For Bethlehem makes every one of the steel items needed to build a modern concrete highway, and any kind of highway bridge.

Let Bethlehem help you avoid confusion, delay and extra paper-work in obtaining road steel for your highway jobs. When you put the supplying of all the steel for a highway project up to Bethlehem, the order is handled as a unit. Shipments from Bethlehem's strategically-located warehouses are arranged to suit your work schedules. You receive the steel when and as you need it.

The nearest Bethlehem district office—or Bethlehem's general offices at Bethlehem, Pa.—will gladly explain how Bethlehem's co-ordinated highway-steel service can save time and money for you.



WIRE ROPE—Bethlehem Wire Rope is made in a full line of sizes, and fills needs of highway builders for crane, shovel, dragline, haulage and other kinds of rope. Bethlehem's top-quality rope is its "Form-Set" (preformed) in the tough, strong Purple Strand grade.

BETHLEHEM PRODUCTS FOR HIGHWAYS

Road Joints • Center Strip • Dowels • Dowel Bar Supports • Reinforcing Bars • Bar Mats • Bar Ties • Reinforcing for Concrete Pipe • Bridge Floor Reinforcing • Concrete Slab Spacers • Welded Wire Fabric • Guard Rails • Guard Posts and Brackets • Wire Rope and Strand • Right-of-Way Fence and Posts • Anchor Rods • Pipe • Hollow Drill Steel • Digging Bars Structural Steel • Mold Boards • Corrugated Sheets • Turnbuckles • Tie Rods, Spikes, Bolts and Nuts • Timber Bridge Hardware Sheet and H-Bearing Piling

★ BETHLEHEM STEEL ★

We build all 4 Material Handling Buckets

PMCO

ALL PURPOSE

- SHOVEL
- PULLSHOVEL
- DRAGLINE
- CLAMSHELL

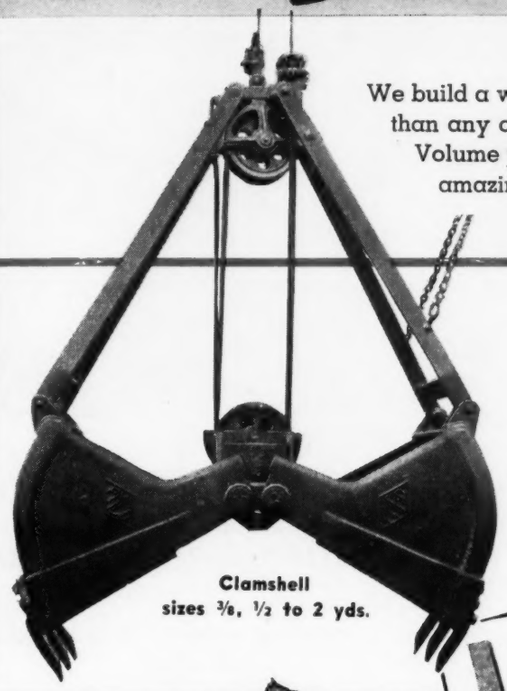
See your shovel engineer or equipment dealer about PMCO dippers and buckets.

AMERICA'S MOST COMPLETE LINE OF MATERIAL HANDLING BUCKETS

We build a wider and more complete line of material handling buckets than any other manufacturer.

Volume production methods enable us to build a better bucket with amazing economies in manufacturing.

. . . Experience Counts . . .



Clamshell
sizes 3/8, 1/2 to 2 yds.

Pullshovel
sizes 3/8, 1/2 and 3/4 yd.

● On the 1/2 yd. and 3/4 yd. sizes of Shovel, Pullshovel, and Dragline Buckets, all teeth are interchangeable . . . a great convenience to operators.

Shovel
sizes 3/8 to 18 yds.

Dragline
sizes 3/8, 1/2, 3/4, 1, 1 1/2, 2, 2 1/2 yds.

WE OPERATE THE LARGEST AND MOST COMPLETE MANGANESE STEEL FOUNDRY IN THE UNITED STATES

Quality Since 1880

PETTIBONE MULLIKEN CORPORATION

4700 West Division Street, Chicago 51, Illinois

Ordinarily on such a project, building materials would be delivered to the work site by locomotives and flatcars, and giant cranes, each moving along its own railroad tracks on a wide fixed trestle.

By eliminating the usual cumbersome equipment with its complex traffic situations and high cost, this unique application of American TIGER BRAND Cable and Wire Rope provides simple operation and extreme flexibility at low cost.

AT SHASTA DAM . . . *American TIGER BRAND Wire Rope is used on the biggest construction tool ever built*

REVOLUTIONARY in conception, costing $600,000 for the head tower alone, the concrete distributing system employed so successfully on this undertaking has deservedly attracted world-wide engineering attention.

TIGER BRAND's part in this immense project is typical of the outstanding role played by this superior wire rope both on the home front and abroad.

Three miles of American TIGER 3-inch Lock Coil Cable were suspended between the 465-foot fixed head tower and seven movable tail towers. By this extensive spiderway of cables and many more miles of U·S·S TIGER BRAND Wire Rope, 16-ton buckets of concrete were conveyed from the central concrete mixing plant to every section of the dam and spillway forms, some more than half a mile distant.

By using these cable and wire rope high-lines to deliver concrete, steel casing and the huge steel penstocks into place, construction and operational problems were vastly simplified. Tons of vital equipment otherwise necessary were left on the nation's stockpile.

TIGER BRAND Wire Rope also assured unfailing operating in the hundreds of scrapers, shovels and bulldozers used on this job.

Excellay Preformed

AMERICAN STEEL & WIRE COMPANY
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BRIXMENT MORTAR

Makes a Better Bond

To make a good bond with the brick, mortar must be plastic, and stay plastic *until the brick is bedded. The two photographs above show a good comparative test for plasticity—hence for bond. Try this with Brixment mortar!*

—AND A GOOD BOND IS REQUIRED FOR STRONG, WATER-TIGHT MASONRY

The first function of a mortar is to form a strong, permanent *bond* with the entire surface of the brick. When such a bond is secured, the result is a strong, water-tight wall.

Brixment mortar makes it possible to secure this kind of bond because:

(1) Its great plasticity and its high water-retaining capacity allow a more thorough bedding of the brick, and a more complete contact between the brick and mortar.

(2) It hardens slowly enough to permit deeper penetration and more thorough keying into the pores of the brick.

(3) Once formed, a bond between brick and Brixment mortar is permanent, because Brixment mortar does not undergo volume changes sufficient to weaken the bond.

Because of these characteristics, Brixment mortar makes a *better, stronger bond.*

LOUISVILLE CEMENT CO., Incorporated, LOUISVILLE 2, KENTUCKY

CEMENT MANUFACTURERS SINCE 1830

IF IT'S A CONCRETE JOB . . .

Bulletin 2036, just off the press, is a condensed package of comprehensive data on the various items of Blaw-Knox Construction Equipment. You will find it a valuable guide for making a profit on jobs that have to be built under modern specifications and in a hurry! Return the coupon for a copy of Bulletin 2036.

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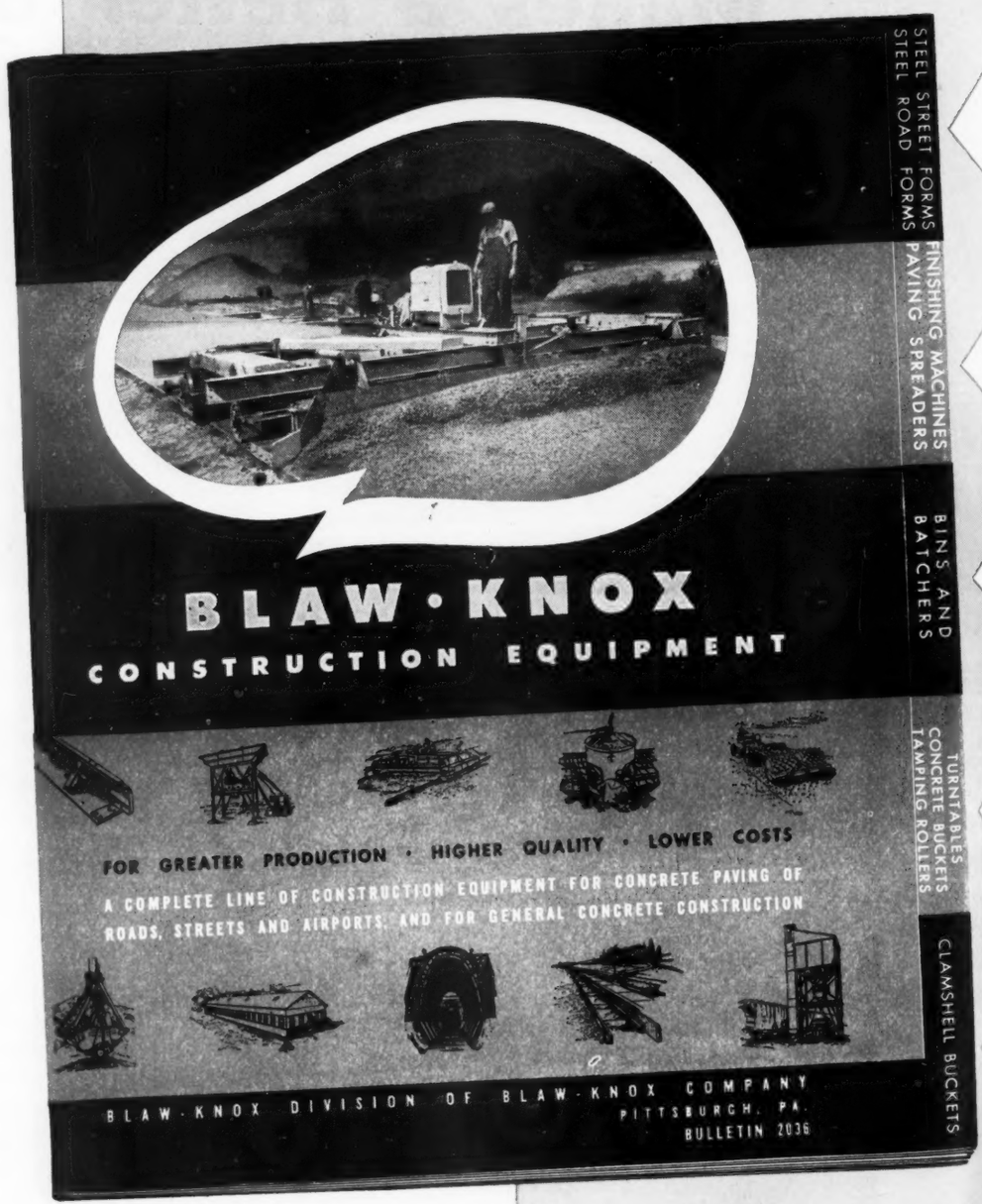

6 plants of Blaw-Knox Company have been awarded the Army-Navy "E" for excellence

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The only self-aligning Paving Form for Airports and Roads . easy to set and keep perfectly aligned . sturdily braced and reinforced for maximum rigidity . . . write for Catalog 2037. Modern Steel Forms for every type of street work such as curb, combined curb and gutter, integral curb, sidewalks, etc., are completely described and illustrated in Catalog 1859.

FINISHING MACHINES - - - PAVING SPREADERS

The record smashing performances of these two outstanding machines should be carefully studied in estimating or planning any concrete road or airport paving project . . . Paving Vibrator attachments available for spreader or finisher . . . Catalogs 2045 and 2046 respectively contain the information you need on Finishing Machines and Paving Spreaders.

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Portable Batching Plants for aggregates and bulk cement . . . Truckmixer Loading Plants . . . Central Mixing Plants . . . Manual and Automatic Weighing Batchers for aggregates, cement and water . . . Bulk Storage Bins for aggregates, cement, lime, coal, cinders and all granular materials . . . complete plants, large or small, standard or tailor-made.

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The unique and efficient Blaw-Knox Roller Gate Concrete Bucket . . . controllable discharge . . . easy to operate . . . types for normal and low slump concrete . . . sizes one to eight cubic yards . . . Catalog 1816. Another type of concrete bucket with clamshell discharge gate in ½, ¾ and 1 cubic yard sizes . . . Bulletin 1870. Sheepsfoot Tamping Rollers of the full oscillating type for compacting embankments . . . Bulletin 1736. Blaw-Knox Portable Truck Turntables for turning trucks in restricted spaces . . . Bulletin 1822.

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Blaw-Knox is Clamshell Bucket Headquarters . . . the right type and size bucket for any service or crane . . . over 100 models to choose from in rehandling, general purpose, hard digging and dredging types . . . Write for Catalog 1757.

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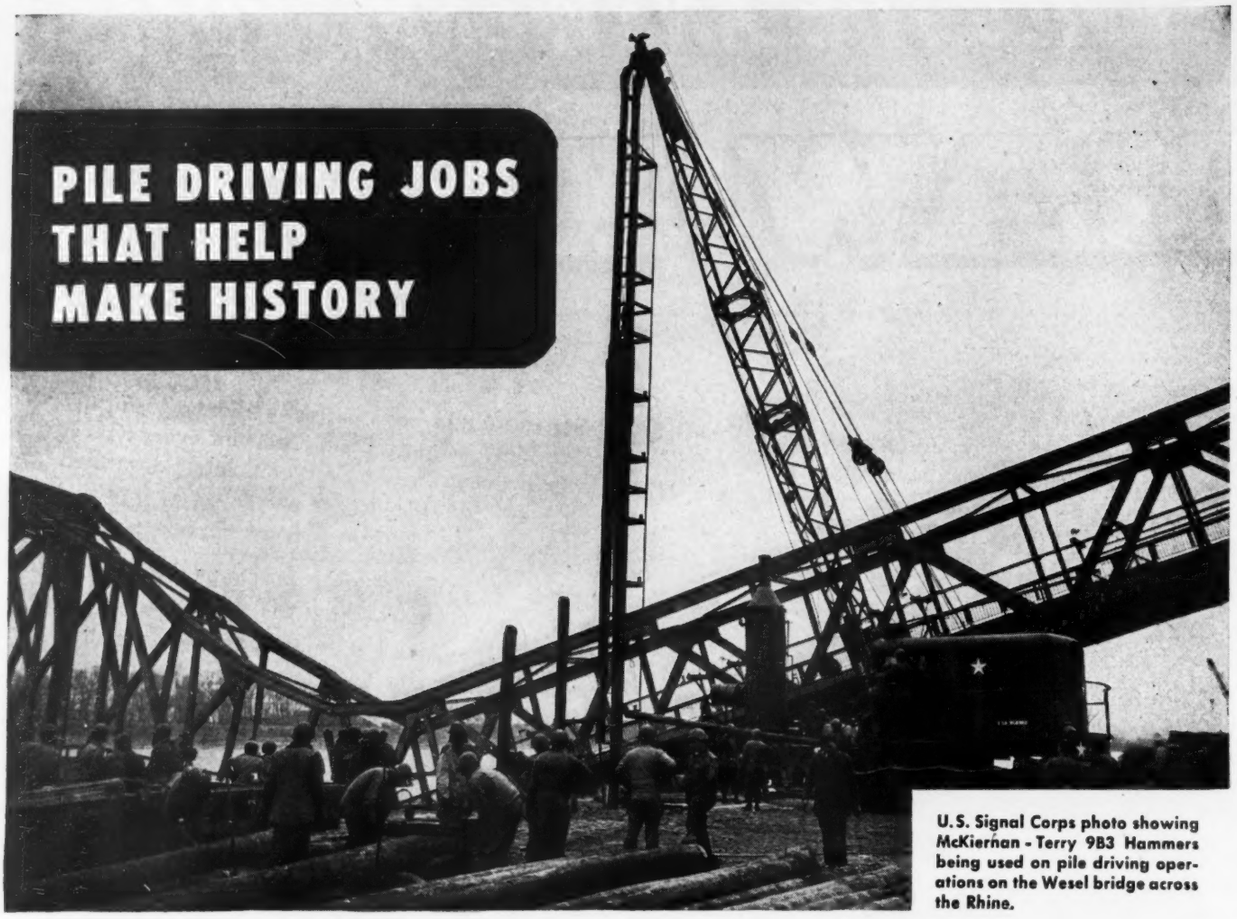
PILE DRIVING JOBS THAT HELP MAKE HISTORY



U.S. Signal Corps photo showing McKiernan - Terry 9B3 Hammers being used on pile driving operations on the Wesel bridge across the Rhine.

When the most advanced front line troop detachments land on beachheads, capture ports or cross rivers in this global War, the first work to be done is to construct or reconstruct these facilities.

Large numbers of McKiernan-Terry Pile Hammers have been used in this work which is of gravest importance. In every theatre of the War they have been essential equipment for U. S. Engineers, Navy Department and Seabees.

Two essential requirements have had to be met in these vital tasks: *PERFECT PERFORMANCE* under the most arduous conditions, and *PROMPT DELIVERIES* under the most exacting schedules.

The large, modern, well-equipped McKiernan-Terry plants at Dover and Harrison, N. J., have produced the required hammers in ever-increasing quantities. The dependability of these machines has been thoroughly demonstrated in every war-time task to which they have been assigned, as well as in hundreds of important prewar projects all over the world.

The same manufacturing facilities and designs that have enabled McKiernan-Terry Pile Hammers to make these records will be available after the War to produce the best, not only in Pile Hammers, but in other products as well . . . Marine Equipment, Hoisting Equipment and Special Machinery, of which much has been and is being furnished to the Navy Department and Maritime Commission during the War. These facilities will help speed peacetime construction jobs and other activities in the Marine Field.

McKiernan-Terry
9B3 Double-Acting Pile Hammer

For Final Victory
Buy MORE War Bonds

McKiernan-Terry CORPORATION

14 PARK ROW **NEW YORK 7, N. Y.**

There's been a big change

★ Today's motor car is simply an improvement of yesterday's horseless carriage. But what an improvement!

Tapered roller bearings have been improved, too. Consider Tyson, the bearing with 30% more load-carrying rollers around the raceway. It looks like a better bearing, and it is. Tyson's extra rollers mean greater capacity, maximum rigidity, longer life. Operators of heavy-duty equipment say Tyson generally lasts twice as long as ordinary bearings with fewer rollers. Where the going is tough, depend on Tyson "All-Rolls" Bearings.

TYSON BEARING CORPORATION • MASSILLON, OHIO

COUNT THE ROLLS · THE ROLLS COUNT

Tyson

THE LAST WORD IN ANTI-FRICTIONEERING

★ BUY WAR BONDS FOR KEEPS ★

UPS DAILY

SPEEDS JOB COMPLETION! From field-tested maintenance schedules to expert technical aid, every detail of Socony-Vacuum's COMPLETE LUBRICATION SERVICE is designed to save time . . . help you break production records!

SOCONY-VACUUM

Contractor's Lubrication

SERVICE

SOCONY-VACUUM OIL COMPANY, INC., and Affiliates:
Magnolia Petroleum Co., General Petroleum Corp. of Calif.

OUTPUT!

THE MOST COMPLETE lubrication service ever offered to contractors—that's the kind Socony-Vacuum brings you! Here's how it helps you *underrun* time estimates—finish ahead of contract dates.

Out in the field, it means fewer breakdowns. Because our line of quality lubricants is complete, you get exactly the right oil or grease for every application—no matter how unusual.

Expertly scheduled on-the-job deliveries save further field interruptions, help reduce inventory problems. And now that you can get *all* your lubricants from just *one* source, you save time in your office, too. No need for special orders, follow-ups.

In your maintenance department, the Socony-Vacuum Representative expedites work many ways! For instance, he'll supply you with job-tested maintenance schedules and help your men adapt them to your specific requirements. He's also equipped to call in engineering help when needed . . . to instruct "green" help on the Do's and Don'ts of Correct Lubrication for all your machines.

All through your operation, Socony-Vacuum's Complete Lubrication Service for Contractors saves time and money—speeds output . . . so why be satisfied with fuels and lubricants alone!

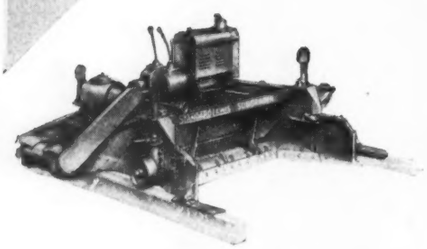
"ON YOUR STAFF—BUT NOT ON YOUR PAYROLL"—
Your Socony-Vacuum Representative

CORRECT LUBRICATION FOR EVERY PART OF EVERY MACHINE YOU OPERATE . . .
PLUS
1 ENGINEERING HELP on time-losing operating problems; 2 TESTED MAINTENANCE SCHEDULES that minimize service man-hours—keep equipment on the job; 3 PROMPT, DEPENDABLE DELIVERY—a reliable, on-the-job service that eliminates inventory problems for you!

TUNE IN "INFORMATION PLEASE"—MONDAY EVENINGS, 9:30 E.W.T.—NBC

12,000

LINEAL FEET OF FINISHED 25 FOOT SUBGRADE IN 8 HOURS



THAT'S A BROAD CLAIM TO MAKE!

But it's based on fact—an actual job record of the STANDARD-LEWIS Subgrader on four 25-foot runways that had to be built in a hurry. In this speedy operation, the STANDARD-LEWIS Subgrader bailed material at the rate of 8 yards per minute and produced a finely finished and accurate subgrade from side form to side form.

FEATURES

1-Quickly adjustable to variable digging depths. 2-Cuts in either direction without turning. 3-Works around curves without binding and tows sideways through narrow places. 4-Digs right up to the side forms, eliminating hand cleaning. 5-Simple lever adjustment for spoiling at either side.

OTHER STANDARD PRODUCTS

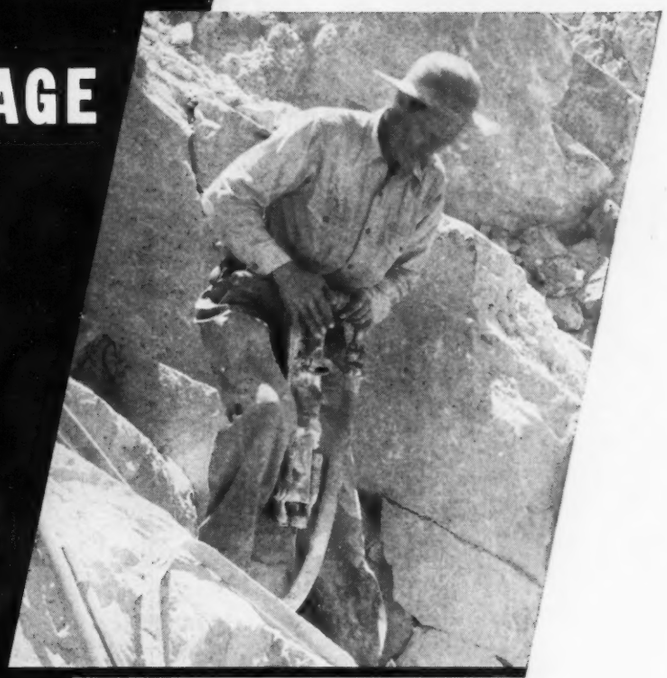
ASPHALT PLANTS • BATCHING PLANTS • ASPHALT FINISHERS • CONCRETE FINISHERS • LOADERS ROLLERS • POWER BROOMS

GET THE WHOLE STORY— SEND FOR THIS BULLETIN

STANDARD STEEL CORPORATION

General Offices and Plant, 5001 South Boyle Avenue
Los Angeles 11, California
Distributors Throughout United States and Canada

SPEED *the* FOOTAGE WITH *Thor* ROCK DRILLS



No. 75
SINKER ROCK DRILL

A general purpose, medium weight machine—one of three of a series in the 56-pound class—for shaft sinking, quarrying, road building and general construction work. Designed for deep, down-hole drilling with powerful rotation, powerful hammer action and powerful hole-blowing . . . for either wet or dry operation. Light and heavy duty drills also available in the complete Thor line.

Tough, on-the-job experience proves the capacity of Thor Rock Drills to drive *more holes per man per shift* . . . they easily out-drill everything on the job in all types of underground and surface hard-rock operations. And, that's not all—along with extra drilling speed, Thor Rock Drills provide low air consumption, minimum vibration, and maximum economy in maintenance.

Extra powerful rotation prevents stalling even in heavy, sticky formations . . . full air power behind the piston gives maximum penetrating and rotating power. Thor *air economy* turns every foot of air into power that, in combination with powerful rotation, assures exceptional hole-cleaning ability and steps up the rate of penetration. *Thor drills are tops for fast, low-cost drilling.*

WHAT THOR "MEASURED AIR" ECONOMY MEANS TO YOU . . .

Balanced Power—only a precisely measured amount of air is allowed behind the piston.

Smooth Performance—every stroke is powered by the same measured quantity of air.

Air Economy—every ounce of air provides a full measure of power for peak efficiency.

Low Maintenance Cost—there are no separate parts of the patented Thor valve to wear out or lose.

For more detailed information about the powerful, easy-operating Thor Rock Drills and other mining and contractors' tools, write for Catalog 42-A.

INDEPENDENT PNEUMATIC TOOL COMPANY
600 W. Jackson Blvd., Chicago 6, Illinois
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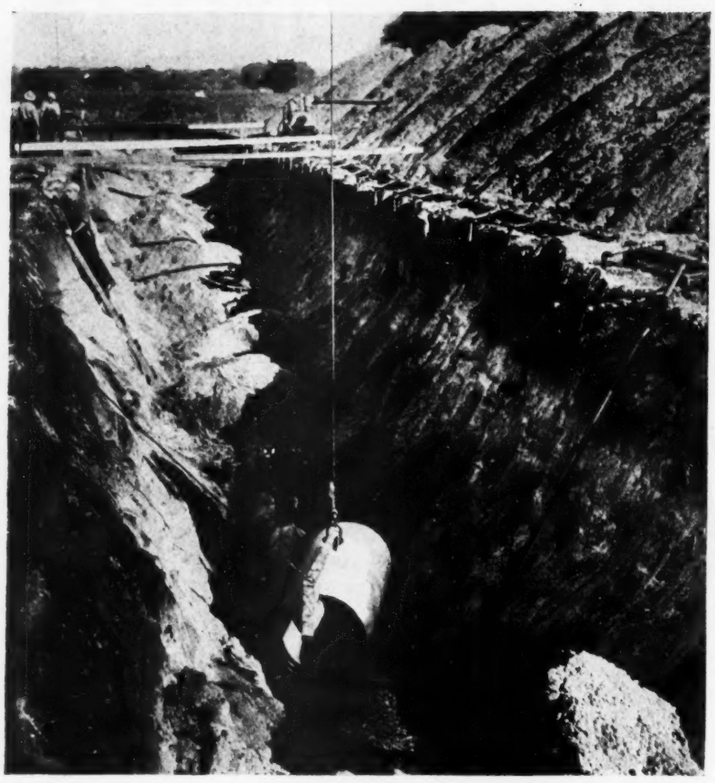
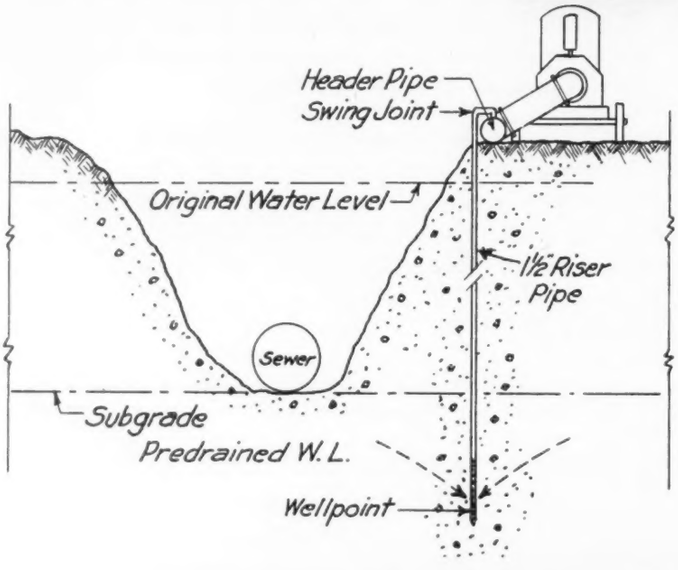
OTHER THOR TOOLS FOR MINING AND CONSTRUCTION

Thor PORTABLE *Electric & Pneumatic* TOOLS
Branches in Principal Cities

A Griffin Wellpoint Job!

GRIFFIN WELLPOINTS *eliminated sheeting and* TRIPLED DAILY PROGRESS





The contractor started this sewer job with tight sheeting and open sump pumping to control a 12-foot depth of water in a 15-foot trench excavation. He averaged less than 50 feet daily with this method.

A phone call to our nearest distributor brought immediate delivery of a Griffin Wellpoint System on a rental basis. After 48 hours' pumping with the Griffin Wellpoint System, he eliminated ALL SHEETING. Upon completion of the entire job, he averaged 150 feet per day. We back up our job layouts with a real guarantee to produce results.

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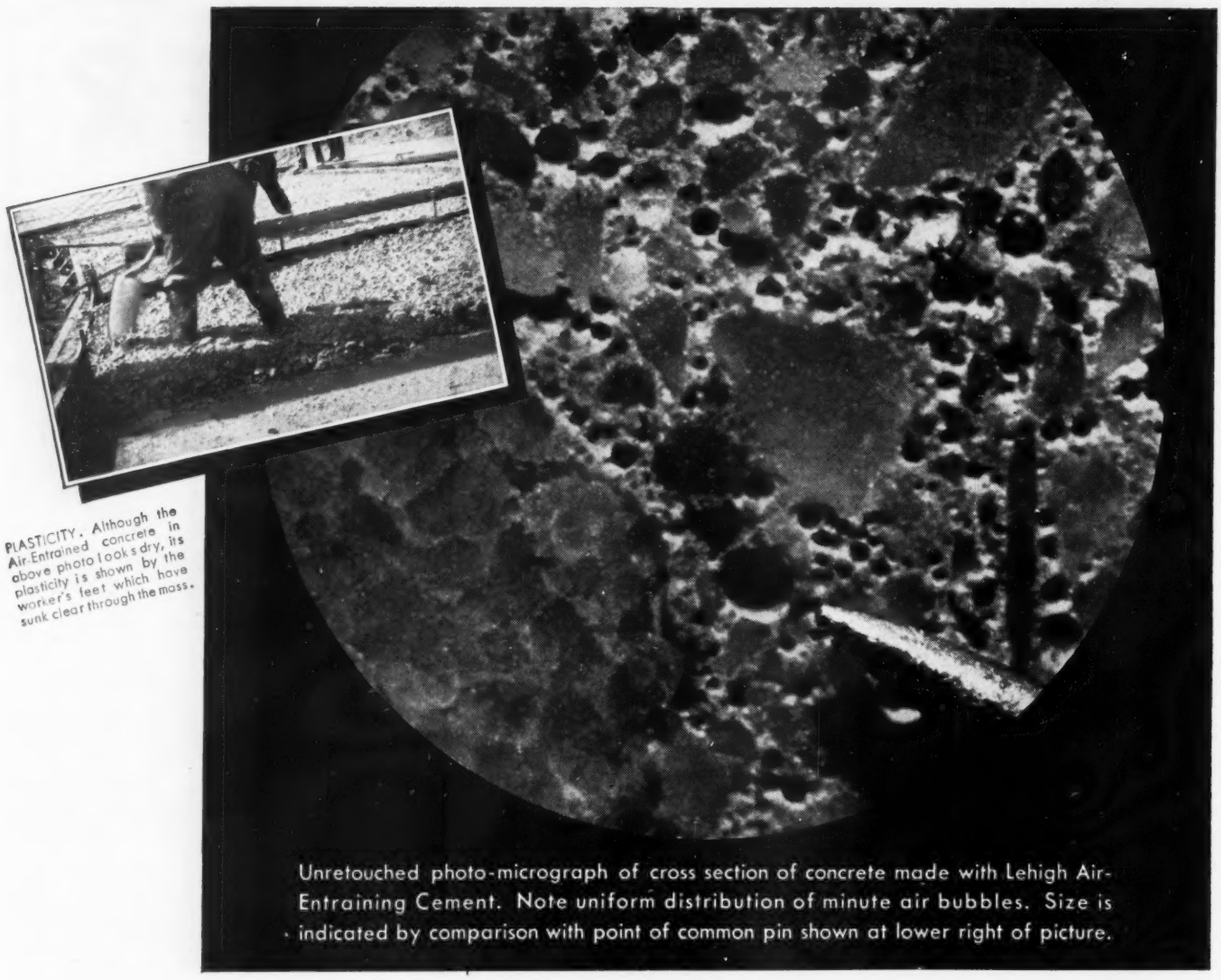
GRIFFIN WELLPOINT CORPORATION

STEEL GOES UP F-A-S-T-E-R WITH A MICHIGAN MOBILE CRANE....

To "make time" on steel-setting jobs you need a crane that can ease cumbersome girders and structural sections into position with speed, accuracy and safety. . . MICHIGAN Mobile CRANES are outstanding for operating ease, stability for handling heavy loads with maximum safety, truck mobility, and many other profit-earning features . . . . Construction activity is due to greatly increase in the near future — have ***you*** modern, cost-cutting equipment which will enable you to ***profitably*** handle ***your*** share? It will pay you to seriously consider MICHIGAN Mobile CRANES and SHOVELS — available in 6 to 12 ton and 3/8 and 1/2 yard capacities, convertible to all standard attachments. . . . Get the facts—write for Bulletin CM-95 today.

MICHIGAN
FINGERTIP AIR CONTROLS
Fast, smooth, positive. Simple, trouble-free, time-tested. Peak operating speeds easily maintained hour after hour — operator fatigue reduced to a minimum.

MICHIGAN
POWER SHOVEL COMPANY
BENTON HARBOR MICHIGAN



PLASTICITY. Although the Air-Entrained concrete in above photo looks dry, its plasticity is shown by the worker's feet which have sunk clear through the mass.

Unretouched photo-micrograph of cross section of concrete made with Lehigh Air-Entraining Cement. Note uniform distribution of minute air bubbles. Size is indicated by comparison with point of common pin shown at lower right of picture.

LEHIGH AIR-ENTRAINING CEMENT

for durable concrete

The millions of tiny air bubbles in concrete made with Lehigh Air-Entraining Cement serve as a lubricant, improving the plasticity of the mix with the use of less water. . . . Distribution of the aggregates is more uniform, the concrete is more cohesive, and there is increased resistance to the settlement of the heavier particles —the cause of bleeding.

Concrete made with Lehigh Air-Entraining Cement is ideal for highways, sidewalks, curbs and gutters, especially in colder climates. . . . Surface scaling is minimized. The durability of the concrete is not impaired by the effects of salts used for ice removal or by freezing and thawing. Lehigh Air-Entraining Cement is portland cement with which an air-entraining agent has been interground in compliance with A.S.T.M. specifications. Concrete made with it is easier to place, spread and screed. . . . With little excess surface water there is no delay in finishing.

The Lehigh Service Department will be glad to consult with you regarding your specific requirements.

LEHIGH PORTLAND CEMENT COMPANY • ALLENTOWN, PA. • CHICAGO, ILL. • SPOKANE, WASH.

If you are interested, write for the booklet "Lehigh Air-Entraining Cement . . . What it is . . . What it does . . . How it should be used."

Lehigh CEMENT

LEHIGH MORTAR CEMENT • LEHIGH NORMAL CEMENT • LEHIGH AIR-ENTRAINING CEMENT • LEHIGH EARLY STRENGTH CEMENT

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Because Flammable Canvas presents a major hazard indoors or out, from sabotage or carelessness—Wm. E. Hooper & Sons Company, with more than a century of "Canvas Engineering" behind them, did something about it.

The result was the first practical fire-, water-, weather- and mildew-resistant canvas — FIRECHIEF FINISHED HOOPERWOOD DUCK, widely used throughout industry and now serving every branch of Uncle Sam's armed forces. (Many millions of yards meeting all government specifications.) The culmination of years of research and development—the success of this phenomenal material lies not in the finish alone but in the construction of the canvas itself, so woven to insure maximum working strength, thorough penetration of the finish, and freedom from irregularities which would impair efficiency in service.

Matching individual needs with the particular canvas construction best suited to the job has been a Hooper tradition since 1800. Today, our entire production is mobilized for Victory. But when business returns to normal, this sound "Canvas Engineering" will mean much to Industry in extending the usefulness of Cotton Duck.

WM. E. HOOPER & SONS CO.

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Mills: WOODBERRY, BALTIMORE, MD.

Since 1800 (through six wars) the HOOPER name has symbolized highest quality in Cotton Duck and other Heavy Cotton Fabrics, Paper Mill Dryer Felts, Filter Cloth, Rope and Sash Cord

HOOPERWOOD REG. U.S. PAT. OFF. DUCK BALTIMORE

HOOPERWOOD COTTON DUCK

Cuts Sewage Carrying Costs— ALL ALONG THE LINE!

LOWER handling costs . . . faster assembly . . . less infiltration . . . high carrying capacity . . . these are some of the ways Transite Sewer Pipe provides important economies *all along the line*—in handling, installation and performance!

And here are the reasons why:

Long lengths, light weight. Transite Sewer Pipe is made in long 13-foot lengths. That means fewer joints . . . more footage per day. Its light weight also speeds up installation, reduces handling costs.

Tight sleeve-type joints. To guard against costly infiltration and keep down the load at the disposal plant, Transite has a sleeve-type joint combining flexibility with tightness. Easily assembled, *stays* tight in service.

Smooth interior surface. An advantage that assures high carrying capacity (Kutter's n=0.010). This frequently permits the use of smaller pipe, or flatter grades with shallower trenches.

An asbestos-cement product. Made of asbestos and cement compressed into a tough, dense, homogeneous structure, Transite Sewer Pipe is strong, durable and highly resistant to destructive agencies underground. Its efficiency and economy has been proved through the years under a wide range of service conditions.

If your plans include sewage works improvements, write for Brochure TR-21A which gives the facts about Transite Sewer Pipe. Johns-Manville, 22 E. 40th St., New York 16, N. Y.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville TRANSITE *SEWER* PIPE

FOR EFFICIENT, ECONOMICAL SEWAGE DISPOSAL

ANTI-FRICTION BEARINGS

A good feature to have in a SHOVEL CRANE or DRAGLINE!

To get the full advantage of anti-friction bearings in a shovel, crane or dragline, the bearings must be applied to every important bearing point, not only on high speed shafts. Anti-friction bearings are the modern means of reducing friction. They transfer the sliding rubbing friction of a journal bearing into a rolling friction. A good demonstration of the difference may be had by first rubbing the palms of your hands together, noticing how warm they get, then take a round pencil or marble, and rolling it between the palms. Rolling motion starts easier than the sliding motion, therefore, less strains are imposed upon the various parts of the machine. In addition to effecting less bearing friction, anti-friction bearings also save oil, grease and fuel consumed by the engine, and that's not all -- anti-friction bearings, when applied to the drums (as they are in a LIMA), hold the drums concentric to their clutch and brake, consequently the clutch and brake action is smooth - no chattering and grabbing. Remember, the more precise the machine the better the performance and the longer its life.

LIMA LOCOMOTIVE WORKS, INCORPORATED
SHOVEL AND CRANE DIVISION — LIMA, OHIO, U. S. A.

LIMA

The LIMA DIAMOND --- For 75 Years an Emblem of Quality Workmanship

Various Types of Bearings used in LIMA Shovels, Cranes and Draglines

A type and size for every job

CAPACITIES
SHOVELS, 3/4 Yd. to 5 Yds.
CRANES, 13 Tons to 100 Tons
DRAGLINES, Variable

SHOVELS • CRANES • DRAGLINES

NEW YORK, N. Y. — CHICAGO, ILL. — NEWARK, N. J. — MEMPHIS, TENN.
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CLEVELANDS'

STAMINA
SPEED
VERSATILITY

ON THE GOLETA PIPE LINE • • •

. . . which had to be built under sidewalks, lawns and paved streets, across mountains, canyons and farm fields, under rivers and along secondary and primary state highways. (16″ and 18″ natural gas line from La Goleta Field to Los Angeles.)

"On The Job"... ONE OF THE FOUR CLEVELANDS USED ON THIS PROJECT

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"CLEVELANDS" Save More . . . Because They Do More

Here Today (Producing 1,026-tons aglime, daily average)

Day after day this versatile Universal portable crushing plant turns out 100 to 114-tons of aglime for L. T. Renner of Rock Falls, Illinois. With a simple 15-minute adjustment both aglime and road rock can be produced without changing the screens. Plant consists of a 546-P primary crushing unit with 20" x 36" jaw crusher and 36" x 8' apron feeder, secondary pulverizer, 4' x 12' double deck screen, 3 compartment bin (lime, rock and surge compartments), conveyors.

gone tomorrow! (Moved on a moment's notice).

With all the ruggedness and stability of a lifelong permanent installation, this Universal engineered plant can be quickly moved to a new location. Primary and secondary units and bin with screens are built on chassis, on which pneumatic-tired wheels are readily installed. Renner gets flexibility of product, lowest cost per yard of finished material and mobility of entire plant. Send for further facts.

Universal Engineering Corporation
327 8th St., West, Cedar Rapids, Iowa

Photos courtesy Eighmy Equipment Co., Rochelle, Ill.—another "live wire" Universal dealer!

ARMY NAVY

UNIVERSAL

ROCK AND GRAVEL CRUSHERS, CRUSHING ROLLS, HAMMER MILLS, COMPLETE CRUSHING AND SCREENING PLANTS, WASHING PLANTS, ASPHALT PLANTS, SPREADERROLLERS.

"Common Sense Applied to Spending"

. . . *that's how to buy explosives, too*

Buying hats and buying explosives have one thing in common—the wrong purchase is no bargain. Price is not the first consideration; it is "what it does for you" that really counts.

So saving on the initial cost of explosives is a false kind of thrift. Often it *increases* expense. It's just common sense to analyze your blasting problem —then choose the *right* explosive for the best results in blasting.

Efficient blasting insures good fragmentation. It increases production—gets more work out of your equipment. Poor breakage is hard on the shovel—lowers daily production.

Your Atlas Representative is a competent blaster. He has 120 different explosives at his command—backed by years of company experience on the best way to use them. Put his up-to-date "know how" to work for you. It will help you produce *real* operating economies.

ATLAS EXPOSITIVES
"Everything for Blasting"

CHEMICALS ATLAS EXPLOSIVES

ATLAS POWDER COMPANY, Wilmington 99, Del. • *Offices in principal cities* • *Cable Address—Atpowco*

Build Better Roads to SEE AMERICA!

Cedarapids

Built by IOWA

The beauty and grandeur of America's scenic wonderlands will beckon travelers soon again when America is once more "a nation on wheels". Many more miles of smooth, all-weather black-top roads will be built, providing both employment and enjoyment for millions of Americans.

Contractors who look ahead, plan ahead, will be the ones who get the bigger, more profitable road contracts. The owner of a Cedarapids Hot or Cold Mix Asphalt Plant is completely prepared to bid on any bituminous job that comes along. Flexible, easy to set up or knock down, these asphalt plants are sure and simple in operation. Grading and proportioning are accurate beyond the tolerance of the most rigid highway department specifications and outstanding performance is attained through the efficient coordination of all parts. Properly balanced, the feeder, driers, elevators, screening, batching and mixing units all work together in close harmony for fast, smooth and accurate production. Let your Iowa dealer tell you more about these profit-making asphalt plants.

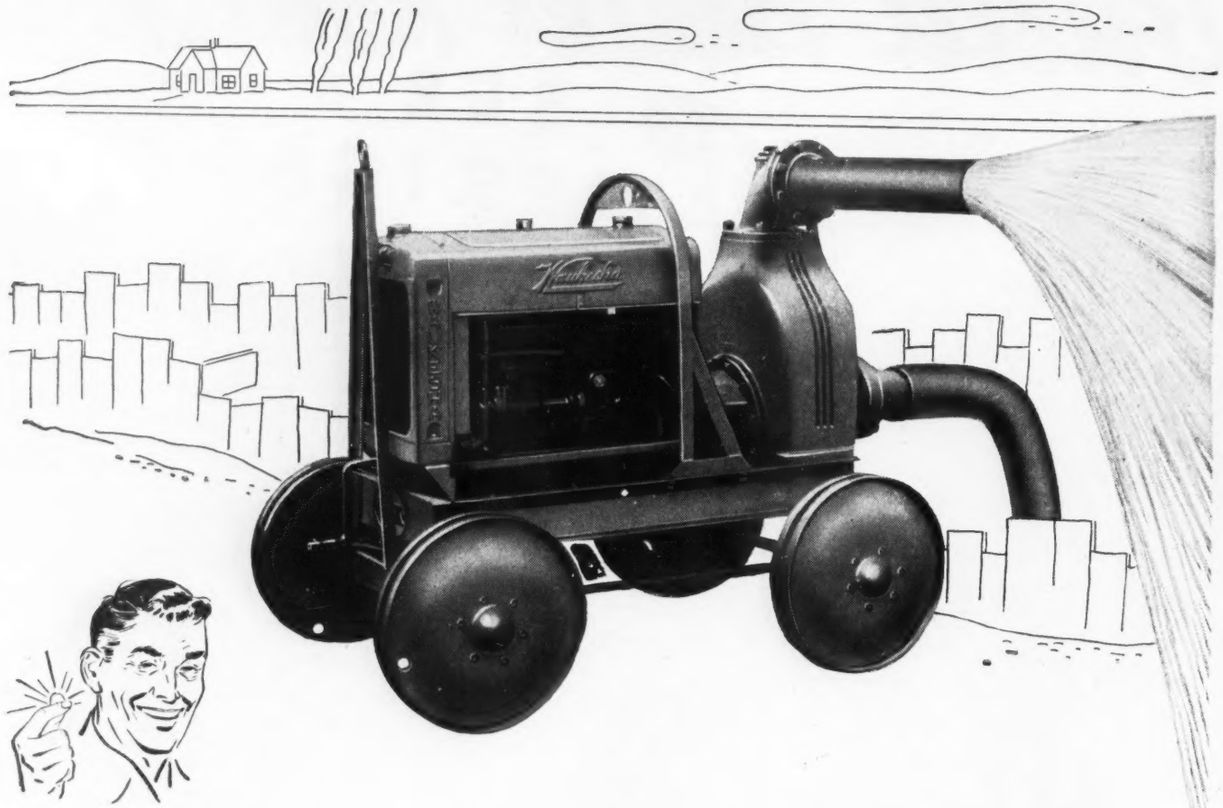
BATCH TYPES OR CONTINUOUS MIX TYPES—all sizes are available.

THE IOWA LINE

of Material Handling Equipment Includes

ROCK AND GRAVEL CRUSHERS
BELT CONVEYORS
STEEL BINS
BUCKET ELEVATORS
VIBRATOR AND REVOLVING SCREENS
STRAIGHT LINE ROCK AND GRAVEL PLANTS
FEEDERS—TRAPS
PORTABLE POWER CONVEYORS
PORTABLE STONE PLANTS
PORTABLE GRAVEL PLANTS
REDUCTION CRUSHERS
BATCH TYPE ASPHALT PLANTS
TRAVELING (ROAD MIX) PLANTS
DRAG SCRAPER TANKS
WASHING PLANTS
TRACTOR-CRUSHER PLANTS
STEEL TRUCKS AND TRAILERS
KUBIT IMPACT BREAKERS

IOWA MANUFACTURING CO.
Cedar Rapids, Iowa



"SPOT IT...START IT...FORGET IT!"

"Yes, sir, that's all you need to do with a Rex Speed Prime Pump," says the owner of a large construction company. "Just spot it on the job . . . start the motor and forget your pumping problems. You'll find that these pumps are easy to transport and will operate dependably without care or trouble."

And you don't have any worries about priming or re-priming. That's all handled automatically by the special Rex Recirculating Valve and the only adjustable "Air-Peeler" that literally peels air from the impeller and rushes it out the discharge line. This means that a Rex Pump starts moving water in the fastest possible time.

What's more, Rex Pumps are built for longer efficiency and service. The "Free Flow" design eliminates water "detours" . . . assures a straight-line flow in the shortest, most direct route to the impeller itself. That's why you pump more water, use less power, maintain pump efficiency longer.

When you specify *Rex, you save money!* If you need pumps now or plan on new ones in the future . . . see your Rex Distributor or write for Bulletin No. 443. Chain Belt Company, 1664 West Bruce Street, Milwaukee 4, Wisconsin.

CHAIN BELT COMPANY *of* MILWAUKEE

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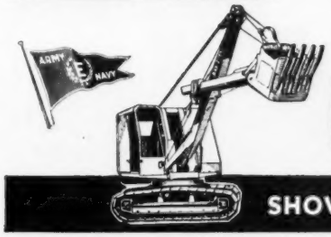
CONSTRUCTION MACHINERY

10-TON CRANEMOBILE —A STURDY PERFORMER ON A WIDE VARIETY OF HEAVY JOBS

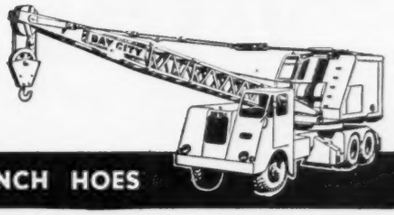
You can handle more excavating and material handling jobs more profitably with a BAY CITY CraneMobile, because you can shuttle your equipment to scattered locations. No loading or unloading necessary. Simply swing the crane boom over the front end of the rugged carrier, step on the starter, and you're on your way—at speeds up to 30 MPH.

The BAY CITY CraneMobile is offered with a full line of convertible boom equipment including shovel, crane, clamshell, dragline, or trenchhoe. Easy, economical operation is assured by the many BAY CITY engineering refinements. Versatile, dependable—designed to meet exacting automotive and material handling requirements. The BAY CITY CraneMobile is a profitable investment. BAY CITY CraneMobiles are made in 5 sizes, from 5 to 20 ton capacity.

See your nearest BAY CITY distributor or write for illustrated catalog of BAY CITY CraneMobiles and other material handling equipment. BAY CITY SHOVELS, INC., BAY CITY, MICHIGAN.



BAY CITY



SHOVELS • CRANES • DRAGLINES • TRENCH HOES

WHEN YOU'RE THINKING OF *Wellpoints*
Consider These Recent Jobs
Dewatered One Hundred Percent
by MORETRENCH WELLPOINT SYSTEMS

Power Plant — Beloit, Wis.
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All built by contractors who know from experience that the best way to handle a wet job is to dig it "in the dry" with Moretrench. Time and money saved. Results guaranteed.

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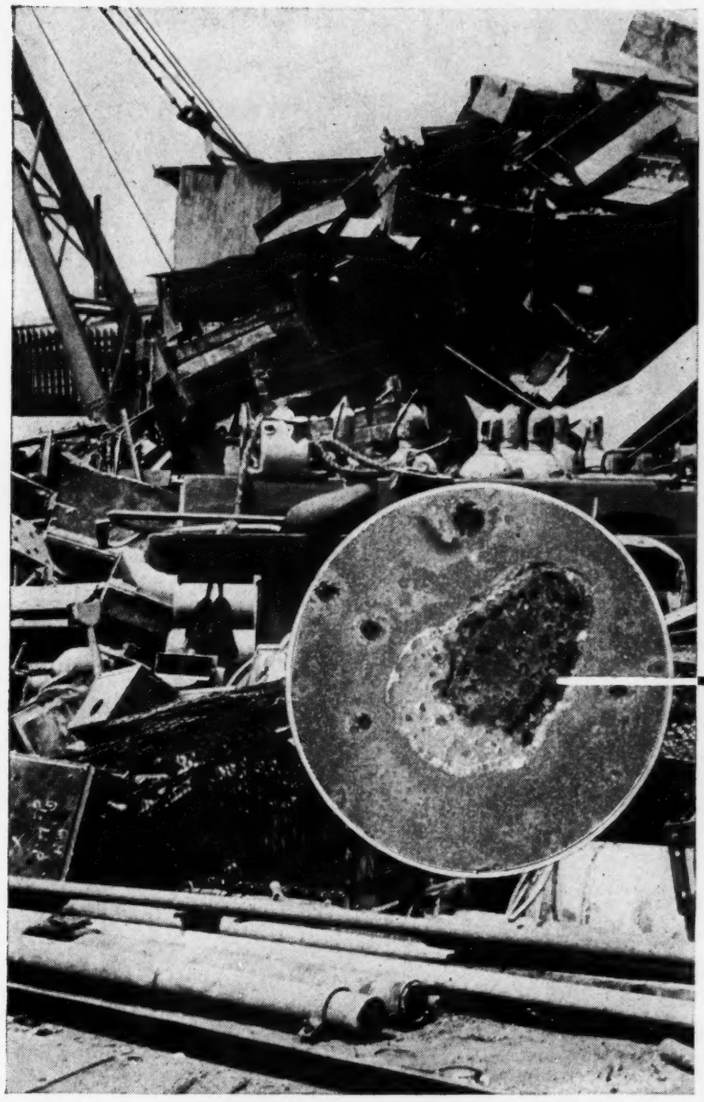

You don't need to put up with —RUST

RUST COSTS AMERICAN INDUSTRY WELL OVER $100,000,000 A YEAR!

How much of that sum could you save if rust were eliminated in your plant?

Cities Service Anti-Corrode and Cities Service Rust Remover quickly and safely effect substantial savings...help insure your production.

Cities Service Rust Remover wipes metals clear of rust or tarnish formations. Easy to apply—acts quickly and effectively.

Cities Service Anti-Corrodes *prevent* rust . . . provide safe and durable protection against rust or corrosion. There is a specific Anti-Corrode for every industrial need.

Talk over your rust problems with a Cities Service lubrication engineer and let him suggest methods for their solution. You will benefit immeasurably from his expert knowledge of the subject. Write now or mail the coupon below.

Rust can be *eliminated*... and Cities Service can *help* you.

Mail this Coupon Today...

CITIES SERVICE OIL COMPANY, Room 404
70 Pine Street, New York 5, New York

Gentlemen: Please send full information on Cities Service Rust Prevention Program.

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Title .....

Company .....

Address .....

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CITIES SERVICE OILS
ONCE-ALWAYS

THE BIG 3

for big jobs at rock-bottom costs

ON-THE-JOB experience proves that no one tread design best meets the needs of *every* job and ground condition on construction operations. Work moves faster, costs drop lower, when prime movers, scrapers, wagons and power units are *each* equipped with the *right* tire for the task at hand:

Super-armored tires for all rock work where the going is rough and rugged;
Sure-roll tires for drawn vehicles where no-drag hauls are musts;
Super-traction tires for drive wheels where traction counts most.

That's why Goodyear off-the-road tires come in the three types shown here. And because these job-proved huskies are true high-hour performers — because they deliver at lower costs-per-ton-mile — they're first choice with cost-conscious contractors everywhere. It will pay you to buy — and specify — Goodyears.

HARD ROCK LUG *super-armored, for all rock work*— Most rugged bruise-resister built. Massive lug bars armor tread and sidewalls against cuts and bruises. Extra-thick undertread armors carcass. Self-cleaning universal two-way tread has no rights, no lefts, provides full traction with same powerful grip reverse or forward.

ALL-WEATHER EARTH-MOVER *sure-roll for drawn vehicles and for general traction*— Designed for general purpose hauling. Rounded contours provide smooth rolling, good mobility on roads and soils. Minimum roll-resistance and low inflation provide flotation, prevent deep penetration of ground surface. Time-proved tread reduces skids and slippage, gives good traction on various soils.

O-P-E-N C-E-N-T-E-R *Self-Cleaning Tread* gives more pull, more traction

SURE-GRIP *super-traction, for drive wheels on all soils*— Provides maximum traction through mud, clay and soft going. Powerful *open center* lug bars dig in deeper, bite sharper, grip and pull steadily under all conditions. Tread is truly self-cleaning because wide channels are *open*, sluice out dirt, mud, stones.

All-Weather, Sure-Grip—T. M.'s The Goodyear T. & R. Co.

GOODYEAR

MORE TONS ARE HAULED ON GOODYEAR TRUCK TIRES THAN ON ANY OTHER KIND

Construction Methods

ROBERT K. TOMLIN, Editor

Volume 27 | SEPTEMBER, 1945 | Number 9

PERMEABLE PILE JETTY under construction on lower Colorado River of Texas is most successful type of control works devised for diverting main current from easily eroded banks to protect adjacent property, highways and railways.

Permeable Pile Jetties STOP RIVER BANK EROSION

COSTLY EROSION OF BANKS has been checked and the threat to nearby railways and highways has been removed by use of permeable trestle-type jetties of pressure-creosoted piles along the rampaging Colorado River of Texas. Not only is further erosion halted by these jetties, but in many places they have caused the river itself to repair previous damage.

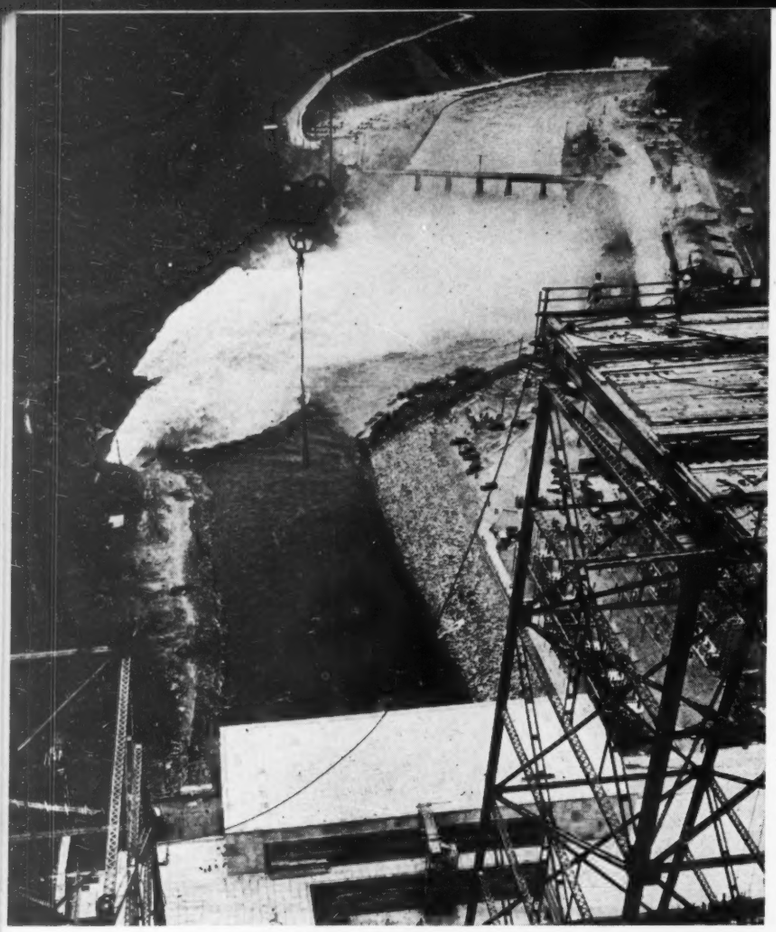
1,250-Ft. Jetty—Two such jetties were recently constructed by the Austin Bridge Co. of Houston, Tex., for the Commissioners Court of Wharton County. One has a total length of 1,250 ft. and contains 23,300 lin. ft. of wood piles and 98,300 b.ft. of timbers and plank. All material is southern yellow pine, pressure treated with creosote by an empty cell process to a net retention of 8 lb. per cu. ft. of wood.

One of the largest jetty installations of this type is located near Bufkin, Tex.

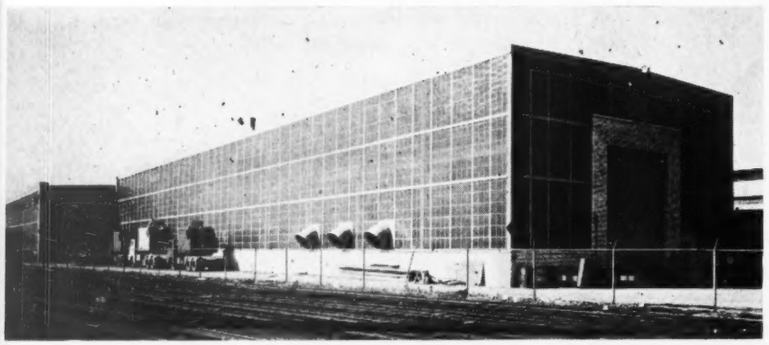
(Continued on page 170)

AFTER TWO YEARS, sand bars have built up in area behind jetties, and badly eroded bank is stabilized by steel angle retards cabled in place to catch debris, which in turn aids accretion of stand and silt.

THIS MONTH'S NEWS REEL

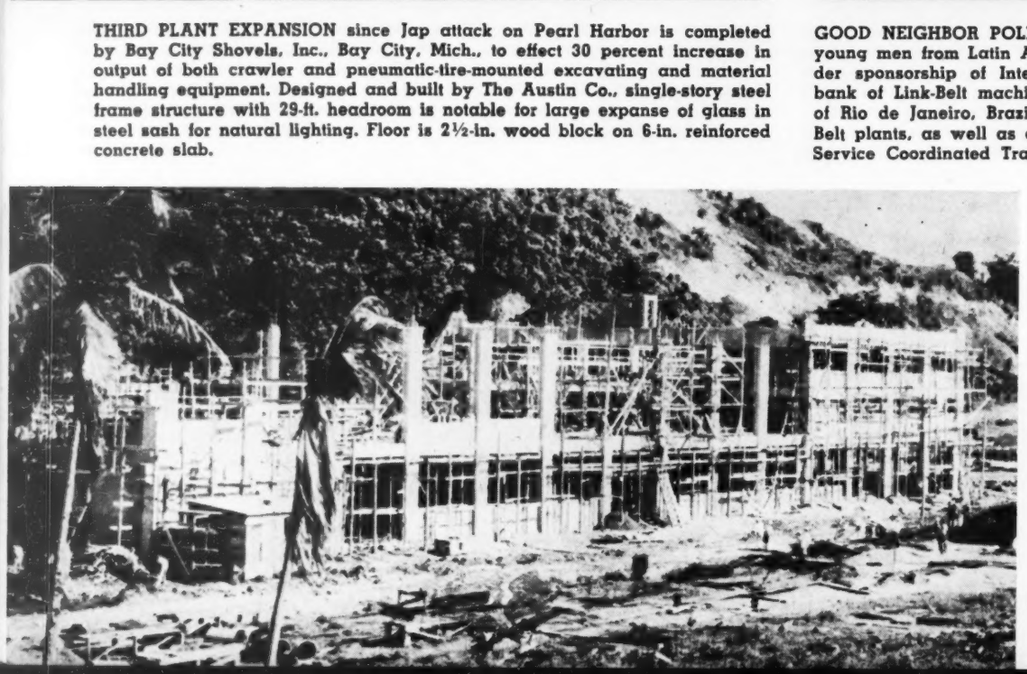


FONTANA DAM SPILLWAY discharges 20,000 cu. ft. of water per second through two 34-ft.-dia. concrete-lined tunnels piercing solid rock of mountain, as TVA conducts hydraulic tests. When these tunnels discharge maximum capacity of 200,000 cfs., water, traveling at velocity of about 150 ft. per second, will be deflected more than 100 ft. into air and spread fan-shaped as spray 400 ft. downstream to reduce erosion of river bed.



THIRD PLANT EXPANSION since Jap attack on Pearl Harbor is completed by Bay City Shovels, Inc., Bay City, Mich., to effect 30 percent increase in output of both crawler and pneumatic-tire-mounted excavating and material handling equipment. Designed and built by The Austin Co., single-story steel frame structure with 29-ft. headroom is notable for large expanse of glass in steel sash for natural lighting. Floor is 2½-in. wood block on 6-in. reinforced concrete slab.

GOOD NEIGHBOR POLICY is furthered by trade scholarships which bring young men from Latin America for training with United States concerns, under sponsorship of International Training Administration, Inc. Pictured at bank of Link-Belt machine he helped assemble is OSWALDO DA PALMA, of Rio de Janeiro, Brazil, who received on-the-job training at several Link-Belt plants, as well as at Worthington Pump & Machinery Corp. and Public Service Coordinated Transport of New Jersey.



← INDUSTRIALIZATION OF PUERTO RICO by businessmen is planned to improve living standards. Here plant is constructed for Puerto Rico Pulp & Paper Corp. at Guaynabo. Other privately-owned manufacturing plants, as well as government-financed projects, have already been built.

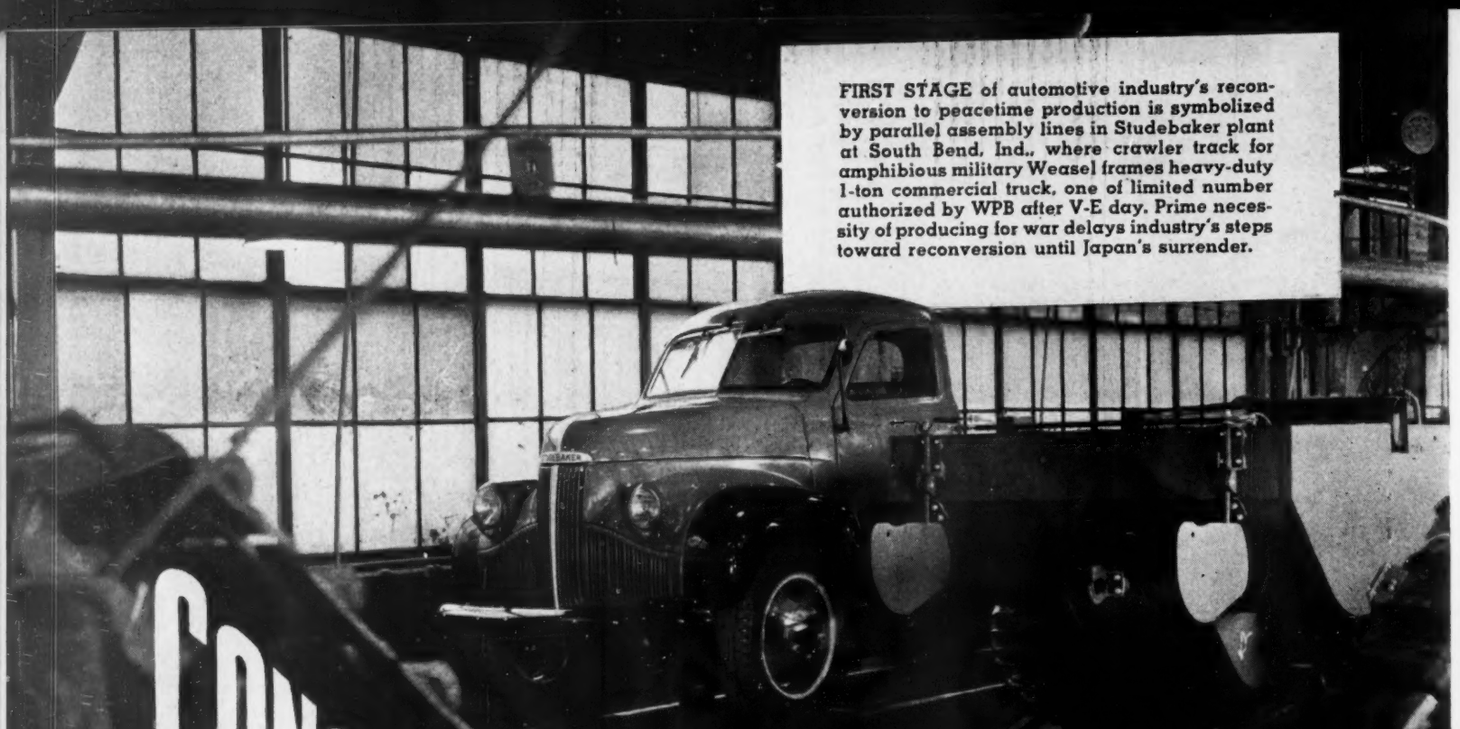
Press Association Photo

EMPIRE STATE BUILDING undergoes repairs after crash by bomber into north side. View at left shows part of wrecked plane and hole it made in 78th and 79th floors. Structural damage was limited to two spandrel beams. Scaffolding (right) was erected by Chesebro, Whitman Co. and will be placed from 77th to 86th floors in north and south courts and from 77th to 82nd floors on west side. Repairs are being made by Starrett Bros. & Eken, Inc., constructor of building in 1930.

← **CONCRETE PILLBOX** erected on coast of southern England as defense against invasion is removed by workmen with pneumatic paving breakers.

READY FOR PEACETIME JOBS, double row of motionless tower cranes in California shipyard symbolize vast resources of equipment and men which now can be directed to new productive labors.

STEEL MESH SUSPENSION BRIDGE (below) carries British soldier across wide stream in northern New Guinea. Mesh is joined to form long strip which is passed through anchoring trestle on each bank.

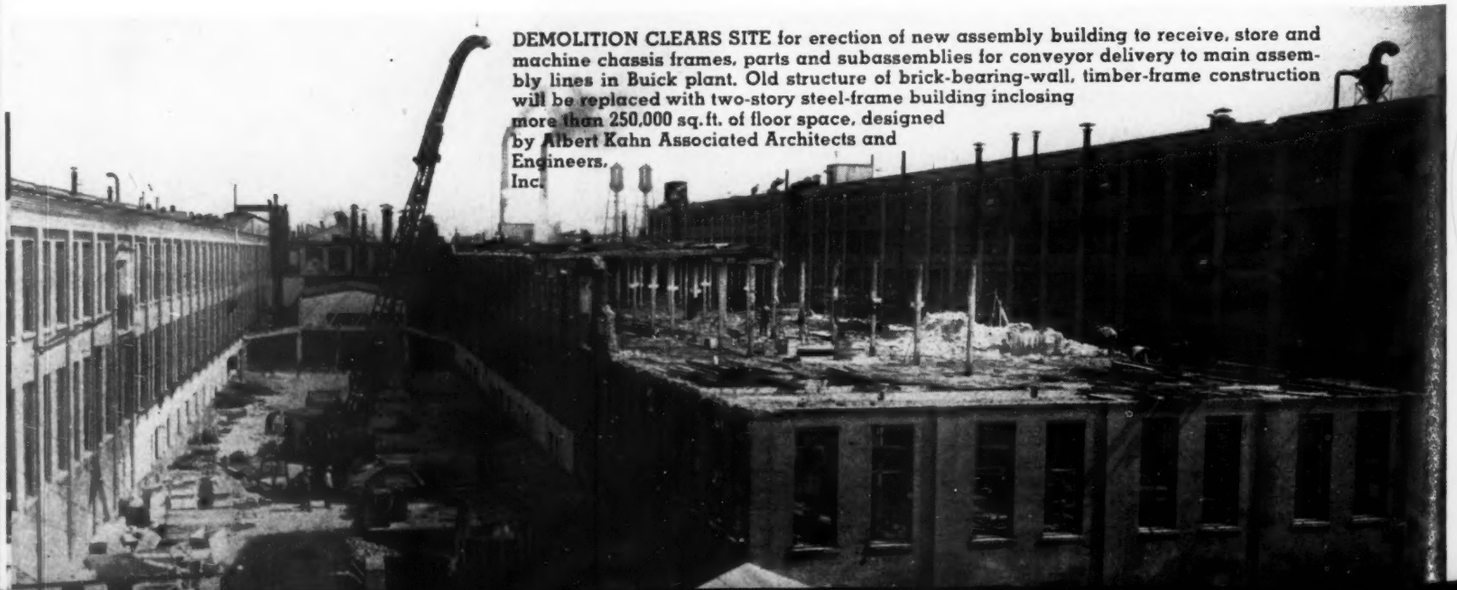


FIRST STAGE of automotive industry's reconversion to peacetime production is symbolized by parallel assembly lines in Studebaker plant at South Bend, Ind., where crawler track for amphibious military Weasel frames heavy-duty 1-ton commercial truck, one of limited number authorized by WPB after V-E day. Prime necessity of producing for war delays industry's steps toward reconversion until Japan's surrender.

CONSTRUCTION FOR RECONVERSION

Automotive Industry Builds $200,000,000 of New Plant to Speed Peacetime Employment

Page 84



DEMOLITION CLEARS SITE for erection of new assembly building to receive, store and machine chassis frames, parts and subassemblies for conveyor delivery to main assembly lines in Buick plant. Old structure of brick-bearing-wall, timber-frame construction will be replaced with two-story steel-frame building inclosing more than 250,000 sq.ft. of floor space, designed by Albert Kahn Associated Architects and Engineers, Inc.

INSIDE EXISTING BUILDING, which will continue to serve as final assembly area in Flint plant, power shovel excavates trench for feeder line from new receiving and storage building.

PARTIAL CONSTRUCTION of new sheet metal shop to clear bottleneck in conveyor lines at Buick plant is given preferential rating by WPB following European victory. Darin & Armstrong salvage steel from old building being demolished to make way for three bays authorized at north end of new sheet metal shop.

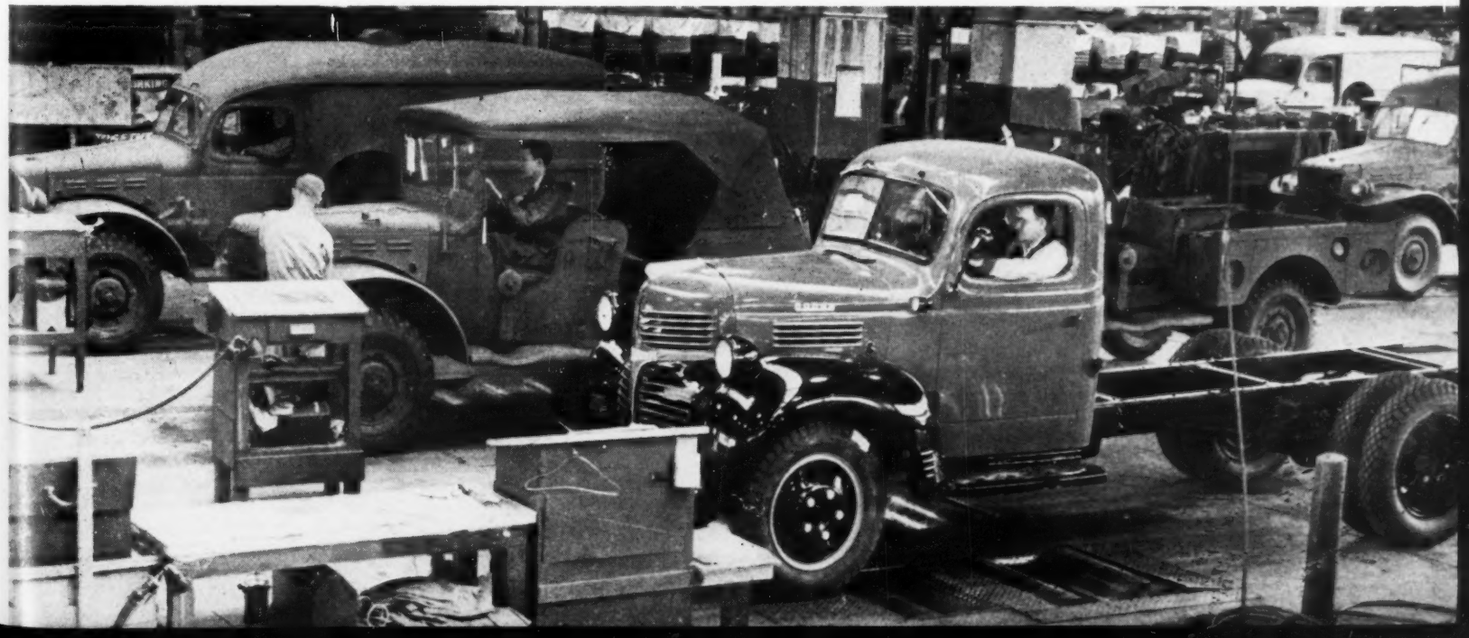
TO CHANGE OVER from all-out war production to a peacetime output 50 percent greater than its pre-war maximum, the automotive industry is investing $200,000,000 in construction as an essential part of a $1,000,000,000 reconversion and rehabilitation program. In the minds of the managers of each manufacturing unit, the dual purpose of keeping pace with competitors in meeting the pent-up demand for motor vehicles and of restoring released war workers as promptly as possible to productive employment—an objective long set up as a post-war goal by the industry's leaders—makes reconversion as urgent a problem as was 100 percent conversion to war in 1942.

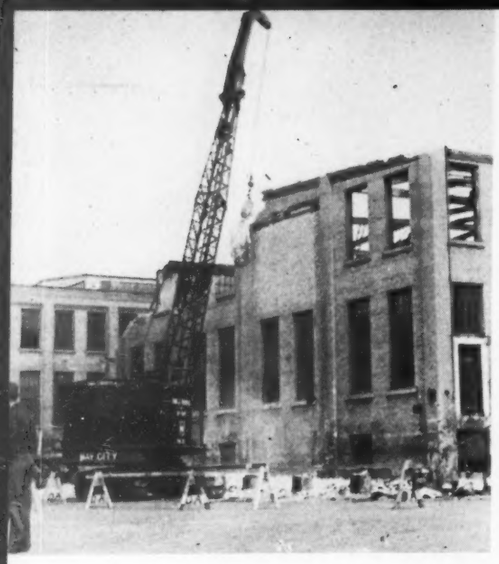
Under the spur of the sudden end of Japanese hostilities, the industry is driving hard to complete this year a major portion of its transition to peacetime production, including the construction of new facilities. The earliest of these construction jobs, indicated by accompanying photographs, got under way with the aid of the War Production Board's first attempts to prepare our domestic economy for reconversion during the two months after V-E day, when a few of the automotive plants most severely in need of rehabilitation obtained authorizations to begin work on essential new plants.

Continuing military demands upon nearly every producer in the automotive industry, coupled with shortages of ma-

WORKS ENGINEER who carries responsibility for coordinating and supervising design and construction in Buick plant at Flint, Mich., is **HAROLD E. HARDENBROOK**, head of works engineering department, which produced designs for five of building extensions or additions in present program.

RESTRICTED FLOW of civilian trucks moves out of Dodge plant alongside military vehicles during first stage of reconversion instituted after fall of Germany. War demands during this period prevent any but most essential steps from being taken toward rebuilding and retooling for peacetime production.



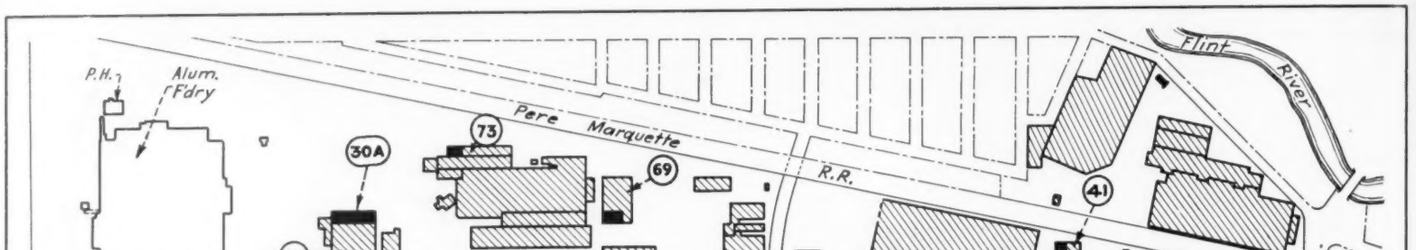


terials and manpower, prevented any liberal action toward reconversion by WPB in the weeks immediately following European victory. The agency did what it could by authorizing, up to July 12, $50,000,000 of new construction for specific plants which could provide peacetime capacity employment only with the aid of essential new facilities. Demolition of obsolete structures, which stood in the way of the peacetime objective, and construction of new buildings in the Buick plant at Flint, Mich., and the Studebaker plant at South Bend, Ind., illustrated on these pages, are representative of a type of reconversion activity given preferential rating by WPB prior to V-J day. Other construction authorizations granted during so-called Period 1, between V-E and V-J days, assigned priorities to a number of other concerns in the automotive field for new factory, assembly and distribution units throughout the country.

Most of the photographs reproduced with these notes illustrate operations on two contracts at Flint. An accompany-

←

AS RAPIDLY AS CUTBACKS in war production after V-E day permit, WPB authorizes motor vehicle manufacturers to begin re-orientation and retooling of plants for peacetime employment. Where obsolete buildings stand in way of reconversion, as in this Buick plant at Flint, Mich., priority ratings are granted to manufacturers to rebuild. Here Charles J. Rogers' crane demolishes brick walls of old assembly building to be replaced with modern structure by Thorgersen & Ericksen, contractors.



RECONVERSION OF MANUFACTURING PLANT at Flint, Mich., by Buick Division of General Motors calls for removal of obsolete structures and replacement with modern facilities which will permit balanced operation and capacity to produce 107 cars per hour, as against a pre-war capacity of 76 cars per hour, looking to annual output of 550,000 units in contrast to 377,000 maximum in biggest past year. Because outmoded structures impede reconversion of plant, preferential ratings for razing old buildings and erecting new units (No. 16, craneway addition to No. 12, and three bays at north end of No. 4) are granted by WPB as promptly as possible after V-E day, when cutbacks in Buick's war contracts allow start on reconstruction.

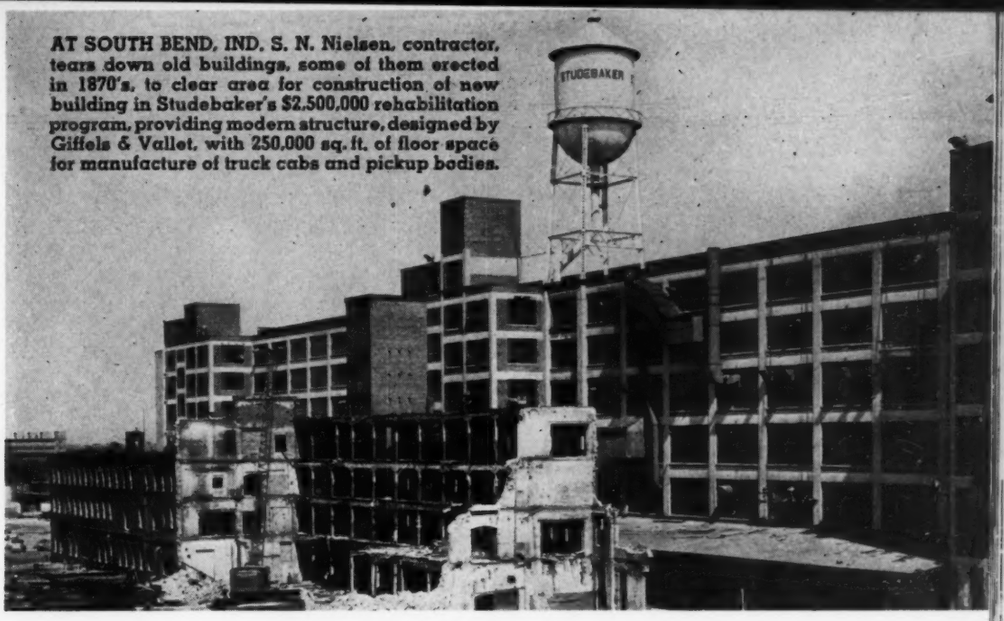
←

ADDITION OF CRANE BAY to press shop at left involves clearing swath between it and smaller building at right and placing footings to carry new craneway columns. Crane in middle distance is driving sheetpiles to protect footings when press pits are excavated. In open aisle at right are temporary enclosures covering large presses which could not be moved under roof during construction of new craneway by Darin & Armstrong at Buick plant.

PUMP ROOM in basement of three-bay section of sheet metal shop requires sheetpiling and bracing to support excavation while concrete footings and walls are constructed on Darin & Armstrong contract.

↓

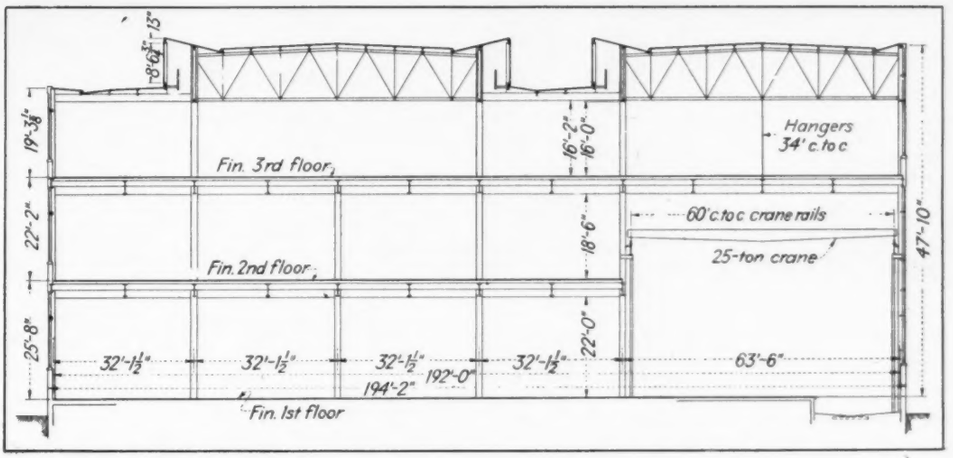
DIRECTING CONSTRUCTION of new assembly building in Buick plant for Thorgersen & Ericksen, **HARRY JOHNSON**, superintendent keeps organization pushing hard for completion of two-story 250,000-sq. ft. structure by first week of January, when painting is to be finished.



AT SOUTH BEND, IND. S. N. Nielsen, contractor, tears down old buildings, some of them erected in 1870's, to clear area for construction of new building in Studebaker's $2,500,000 rehabilitation program, providing modern structure, designed by Giffels & Vallet, with 250,000 sq. ft. of floor space for manufacture of truck cabs and pickup bodies.

ing layout of the Buick plant in that city shows in black the new buildings needed to replace obsolete structures and provide additional capacity paving the way to employment of 22,000 workers. About July 1, Buick signed a contract with Thorgersen & Ericksen, of Chicago, to construct No. 16, a two-story building of 250,000-sq.ft. floor area in the assembly section of the plant, and No. 41A, with 11,000 sq.ft. of floor space, an addition to the heat-treating facilities. On July 14, an agreement was signed with Darin & Armstrong, Inc., Detroit, to: (1) Construct a new craneway bay, 80,000 sq.ft. in area, parallel with the existing single craneway bay of

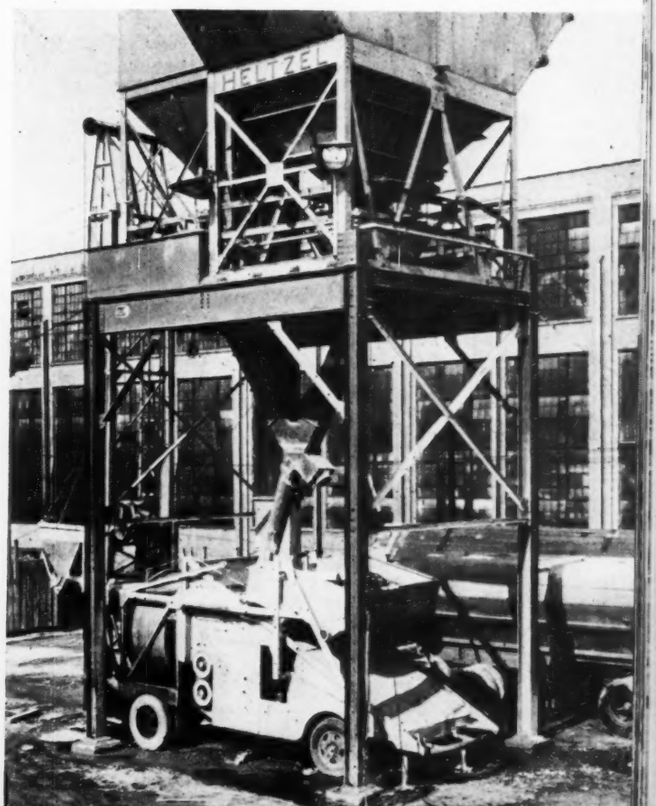
(Continued on page 122)



VERTICAL CLEARANCES ranging from 22 ft. on manufacturing floors to 16 ft. on storage floor characterize modern building designed by Albert Kahn Associated Architects and Engineers to house Buick's sheet metal operations. Structure replaces obsolete buildings in which low ceiling heights of 10 and 12 ft. proved grossly inadequate for conveyor-line processing and handling of sheet metal parts. Live load capacity increases to 200 lb. per sq. ft. from former low of 80 lb. in many places. Note hangers from roof trusses supporting floor framing above craneways at 34-ft. centers.

ALONGSIDE EXISTING PRESS SHOP, Darin & Armstrong put new footings on both sides of each present footing and construct heavily reinforced concrete beam, resting on new footings, to carry pedestal of new craneway column.

CENTRAL MIXING PLANT erected on vacant lot by Darin & Armstrong consists of self-propelled 2-yd. Mixmobile spotted under batching plant equipped with 25-yd. sand and gravel bins and 200-bbl. cement bin. Bulk cement is supplied from 75-bbl. tank trailers unloaded by self-powered screws. Aggregate bins are filled from stockpile by Owen 1.4-yd. clamshell on 65-ft. boom of Osgood crane. Tower hopper on Mixmobile unit charges concrete into open-body dump trucks equipped with rear-end gates.

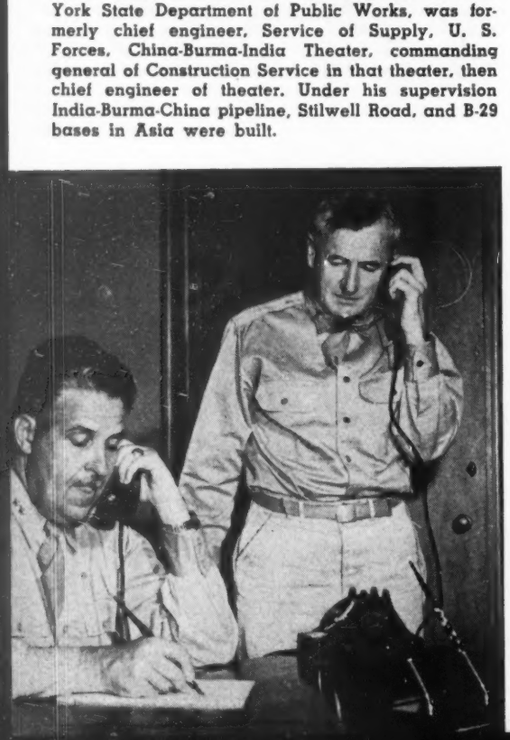


MAIN BUILDING IN VAST PRODUCTION PLANT of Clinton Engineer Works, 18 mi. west of Knoxville, Tenn., is U-shaped in plan, each side being 2,450 ft. long, 400 ft. wide and 60 ft. high. Building is part of $2,000,000,000 project for developing atomic bomb.

Fast Work on Huge Plants Hastens Production of *Atomic Bomb*

Official U. S. Army Photos

IN WAR DEPARTMENT main responsibility for successful prosecution of program rests with Maj. Gen. LESLIE R. GROVES (left, below) whose administrative skill makes possible development of atomic bomb for our armed forces in short time. Formerly, as deputy chief of construction in Washington Office of Chief of Engineers until summoned for this special assignment in summer of 1942, General Groves aided all military construction in United States, with expenditures averaging $600,000,000 monthly, including supervision of erection of Pentagon Building across Potomac from Washington. His assistant on atomic bomb project, Maj. Gen. THOMAS F. FARRELL (right), on leave from his duties as chief engineer of New York State Department of Public Works, was formerly chief engineer, Service of Supply, U. S. Forces, China-Burma-India Theater, commanding general of Construction Service in that theater, then chief engineer of theater. Under his supervision India-Burma-China pipeline, Stilwell Road, and B-29 bases in Asia were built.



A NEW ERA IN WORLD HISTORY was ushered in with the announcement that science had triumphed in its efforts to release the tremendous power contained in the atom. Years of development culminated successfully in a test conducted in New Mexico and in the destruction of Hiroshima, Japan, Aug. 6, 1945, by an atomic bomb.

Events leading up to this epochal scientific development have been cloaked in strictest secrecy. Some information has been released by the War Department as to the size of the project and the speed with which it was built, but details of plant construction and operation are not yet available.

Three Huge Plants Built—Exigencies of war prompted the government in December, 1942 to proceed with the construction of three large-scale plants, two at the Clinton Engineer Works in Tennessee and the third at the Hanford Engineer Works in the State of Washington. Identification of the atomic bomb project was camouflaged by the name, "Manhattan Engineer District," selected by the director of the vast project, Maj. Gen. Leslie R. Groves.

Work of the Manhattan District, an organization without territorial limits, includes contracts for construction and operation in all sections of the United States and some parts of Canada. In ad-

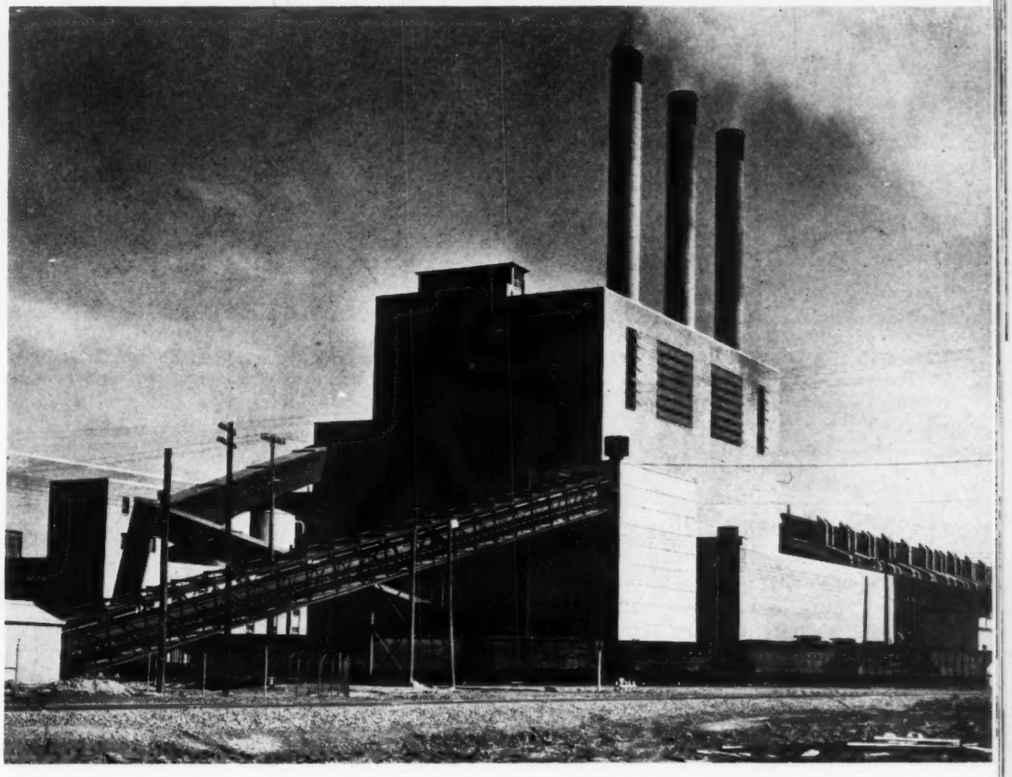
SUPERVISOR OF SPECIAL ORGANIZATION set up in summer of 1942 to conduct research, construction and operational phases of atomic bomb project is COL. KENNETH D. NICHOLS, district engineer of Manhattan Engineer District.

RAPID PREPARATION OF PLANT SITES and construction of access highways by modern equipment sped atomic bomb project to its successful climax. Here, bottom-dump Euclid is loaded during construction of 23-mi. stretch of access highway between Knoxville and Oak Ridge, Tenn.

dition to the plants in Tennessee and Washington, a laboratory and living accommodations for employees were built near Santa Fe, N. M.

These huge plants and adequate housing facilities for some 100,000 people—employees and their families—are the construction industry's contribution to the $2,000,000,000 project which led to one of science's greatest achievements, the release of atomic energy.

Construction Materials—From the latter part of 1942 to May 1, 1945, the amount of lumber used by the Clinton Engineer Works was in excess of 200,-

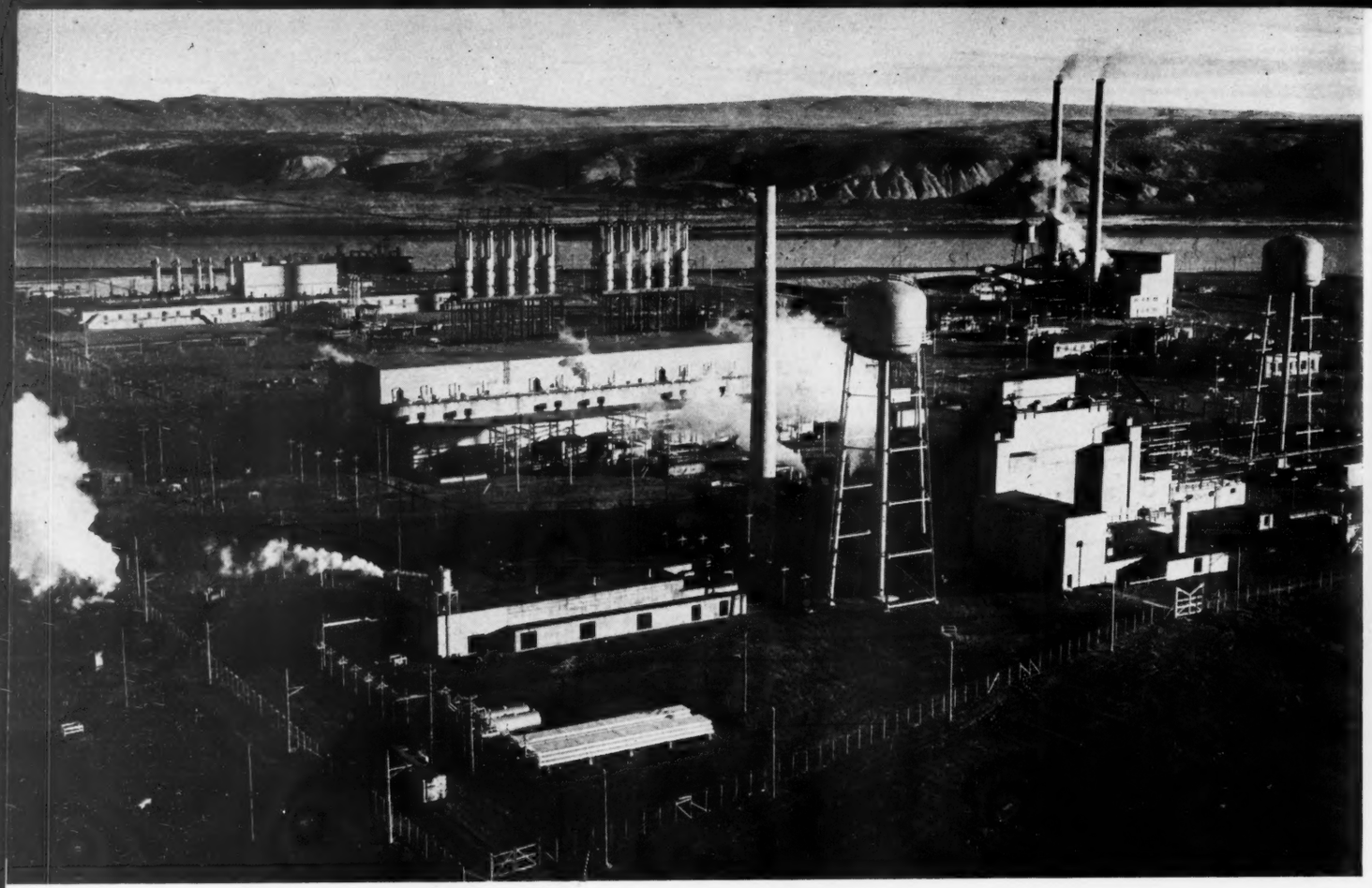


HUGE STEAM POWER PLANT with 238,000-kw. capacity at Clinton Engineer Works supplements power from TVA for processing materials used in atomic bomb.

ATOM SPLITTERS of Manhattan Engineer District get special shoulder patch representing atomic solar system being shattered by lightning in form of question mark—a symbol for all in looking at the future.

COL. FRANKLIN T. MATTHIAS (below) is commanding officer of 631-sq. mi. Hanford Engineer Works in State of Washington which processes raw materials for atomic bombs. As area engineer of Hanford phase of Manhattan District he was responsible for construction of camps, houses and facilities for as many as 45,000 workers at peak of construction activity.

1,000 HOUSES PER MONTH,—or one home every 2 hr.—is peak construction pace reached at Oak Ridge (below) in building 10,000 such family units. Dormitories provide living quarters for 13,000 residents, huts and barracks accommodate an additional 16,000 people, and there are more than 5,000 trailers.



HANFORD PLANT MANUFACTURING AREA is divided into three parts, each of which is subdivided into sections covering many square miles. One such production area is shown here. Facilities at Hanford Engineer Works and town of Richland require excavating 25,000,000 cu. yd. of earth and building 345 mi. of roads.

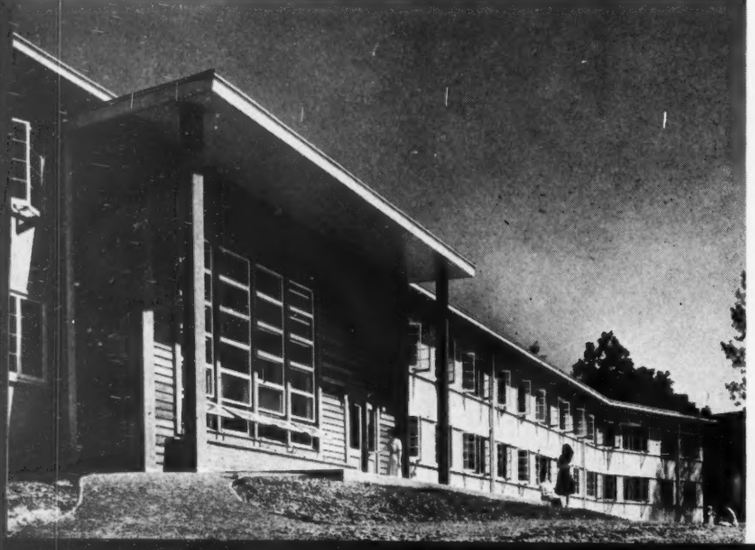
000,000 b. ft., almost equalling the yearly output of the State of Minnesota. Around 400,000 cu. yd. of concrete was used for foundations and some of the structural frames in the plant areas. Approximately 55,000 carloads of material and equipment were shipped to Clinton Engineer Works from November 1942 through June 1945.

Equipment Required—During the peak construction period in July and August, 1944, Clinton Engineer Works used 800 pieces of heavy construction equipment, 5,600 of light construction equipment,

(Continued on page 160)

SITE DIAGRAM shows relative location of Hanford Engineer Works to government-built town of Richland, Wash., and shows main highways to other cities. Isolated location serves safety and security.

ATTRACTIVE yet economically constructed apartment buildings provide modern units for thousands of workers and their families at Oak Ridge, Tenn.



Keeps War-Worn Equipment IN SERVICE

By SAM BRADSHAW

Maintenance Foreman in Charge of
Heavy Highway and Surfacing Equipment
Patton & Linton, Contractors
Pocatello, Idaho

MAINTENANCE IS MORE than keeping worn equipment in running order. Our job for the last two years has been to condition worn draglines, shovels and tractors so that we can crowd them to the limit without lay-ups.

When not on maintenance and repair work I have been pinch-hitting as operator on a combination dragline and shovel. This machine should have been retired several years ago, but it has been working two shifts a day, six days a week for more than a year. While this hard grind has meant a full seventh day of maintenance and service, the machine has made a record of no lay-ups.

Each time the machine is idle during the day it is checked from boom sheave to treads. Cable is run through and examined. The power unit is gone over with as much care as we formerly used for a machine shop check-up.

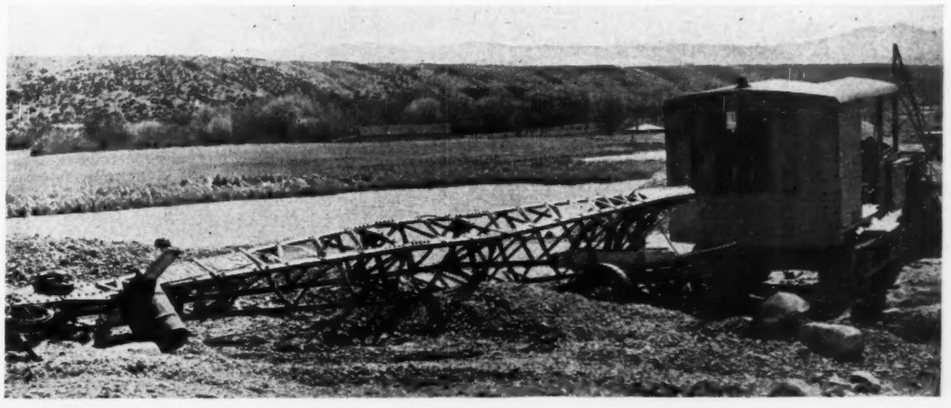
Care of Wire Rope

Once a week the cable is cleaned, thoroughly inspected, and given a new dressing. Cable ends showing wear are cut back, and ends often are switched. Retired 9/16-in. rope from the dozers is used as a dump cable for the dragline. In treating cables with a lubricant we follow the manufacturer's recommendations to the letter. We have found that

(Continued on page 180)

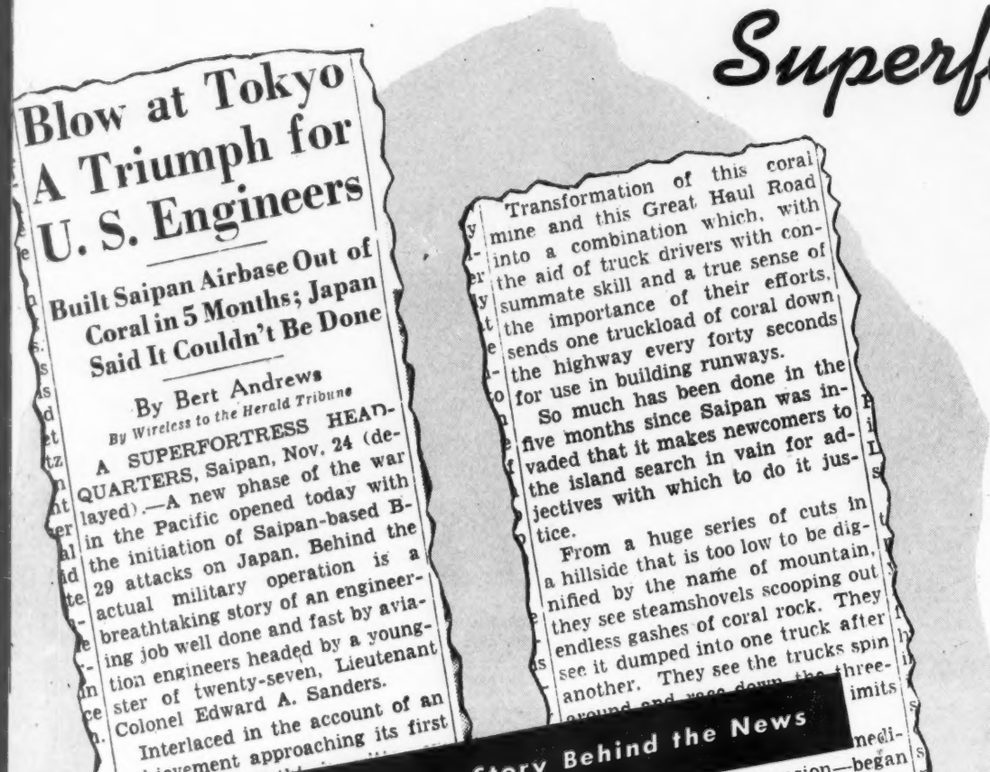
OVERALL CHECK-UP of dragline and shovel is made every time machine is idle. Cable is run through and examined by SAM BRADSHAW.

WHEN RETIRED from this International bulldozer, 9/16-in. cable will be used as dump cable on dragline. Before reassignment it will be given regular storage inspection and servicing.



TWO BOOMS permit combination change on Northwest dragline and shovel. Second boom was made in company's shop, where third is now being built.

Aviation Engineers Master Marianas Coral in High-Speed Construction of *Superfortress Bases*



Blow at Tokyo A Triumph for U. S. Engineers

Built Saipan Airbase Out of Coral in 5 Months; Japan Said It Couldn't Be Done

By Bert Andrews

By Wireless to the Herald Tribune

A SUPERFORTRESS HEADQUARTERS, Saipan, Nov. 24 (delayed).—A new phase of the war in the Pacific opened today with the initiation of Saipan-based B-29 attacks on Japan. Behind the actual military operation is a breathtaking story of an engineering job well done and fast by aviation engineers headed by a youngster of twenty-seven, Lieutenant Colonel Edward A. Sanders.

Interlaced in the account of an achievement approaching its first

Transformation of this coral mine and this Great Haul Road into a combination which, with the aid of truck drivers with consummate skill and a true sense of the importance of their efforts, sends one truckload of coral down the highway every forty seconds for use in building runways.

So much has been done in the five months since Saipan was invaded that it makes newcomers to the island search in vain for adjectives with which to do it justice.

From a huge series of cuts in a hillside that is too low to be dignified by the name of mountain, they see steamshovels scooping out endless gashes of coral rock. They see it dumped into one truck after another. They see the trucks spin

The Construction Story Behind the News

worked on the second try).

Construction of a new superhighway that bears the appropriate name of Great Haul Road and which now ranks in importance in America's war effort with the Burma Road.

Development of a "coral mine" which will pay off more in humanitarian dividends than any gold mine ever worked.

ately after the invasion—began indeed when Tokyo Rose was telling her English-speaking listeners that Japan was confident it would be impossible to build a base anywhere in the Marianas big enough to hold bombers great enough to threaten Japan.

Six days after the Saipan invasion aviation engineers took over, refilled 600 holes in the Japanese Aslito Airdrome and within twenty-four hours sat back and beamed as the first Thunderbolt

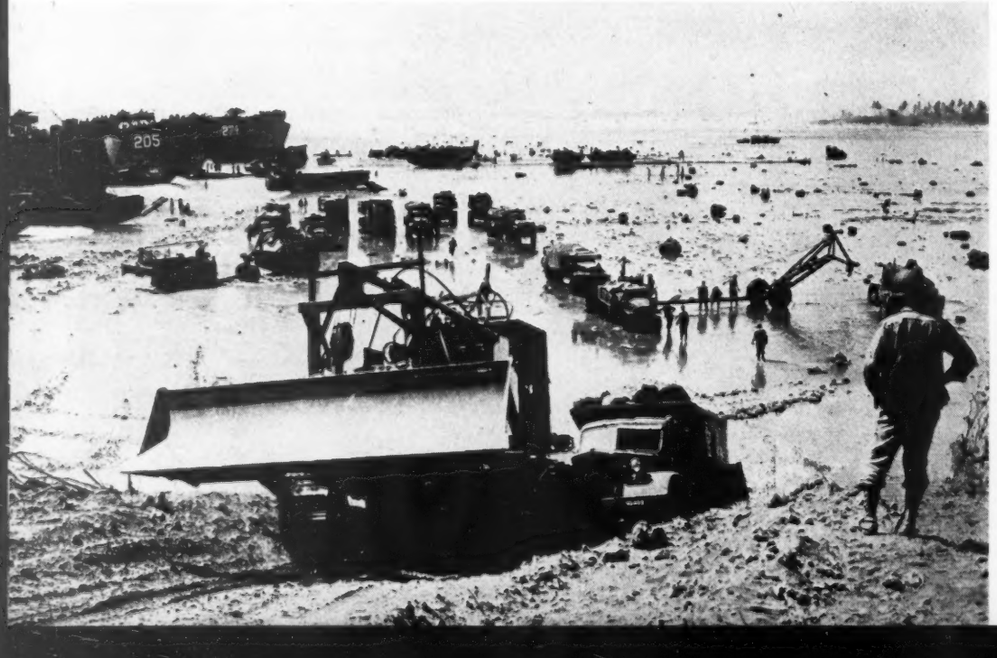
By the Office of the Air Engineer
Army Air Forces, Pacific Ocean Area

FIVE DAYS AFTER the first U. S. troops landed on Saipan—a strategically important island in the Marianas Group—no sane engineer would have contracted to build a B-29 base in a year, much less in a little more than 3 months. But the Aviation Engineers, whose first battalion landed at that time, cannot afford the luxury of sanity. They had the assignment; they had to accomplish it regardless of existing conditions.

Those conditions were worse than had been expected. It was known, of course, that building the first very long range bomber field in a Pacific combat area would offer unprecedented construction problems. In anticipation of these problems, the Air Force engineers planned as carefully as available information would permit. Their pre-invasion studies covered old geographical reports, captured Japanese documents and aerial reconnaissance photographs. They knew where the Japanese airfields were, and which of them gave promise of being developed into bomber runways.

But none of the available data told the full story of the mammoth task which faced the Engineers. Reconnaissance parties, pushing into Saipan while the first battalion unloaded its equipment on the beachhead, discovered that the island's hard coral rock sub-surface was covered by not more than 1 ft. of topsoil and that great areas had no cover whatsoever. The rock was too hard to be torn up by medium rooters; the grading job called for heavy rooters augmented by constant blasting.

Design characteristics of the best Japanese field on the island, Aslito, were deficient in many respects for conversion to an air base for long range bombers. Photographs showed that it consisted of only a 3,900-ft. fighter strip and a secondary runway which had been graded for about 2,500 ft. Reconnaissance parties found the field to be even worse



← **HEAVY CONSTRUCTION EQUIPMENT AND SUPPLIES** are unloaded from LST's across wide coral reef on beach at Saipan. Many shell holes and bomb craters have to be repaired, coral heads dozed down and access roads hastily constructed before cargo can be discharged. In foreground of photograph bulldozer tows supply-laden dump truck up steep road through 40-ft. coral embankment bordering beachhead.

U. S. Official Photo

ROLLERS COMPACT BASE for B-29 runway at a strategic Marianas airfield as 7th Air Force B-24 Liberator comes in on finished section after long overwater strike at Jap base in Bonin Islands.

than had been feared. Heavy fighting before and after D-day, June 15, 1944, had pockmarked the field with nearly 600 shell holes ranging in size up to huge bomb craters. These would have to be filled in. A coral bluff 700 ft. long and 500 ft. wide, which crossed the site for the proposed B-29 runways, would have to be cut down at least 20 ft.

Field Operates During Construction

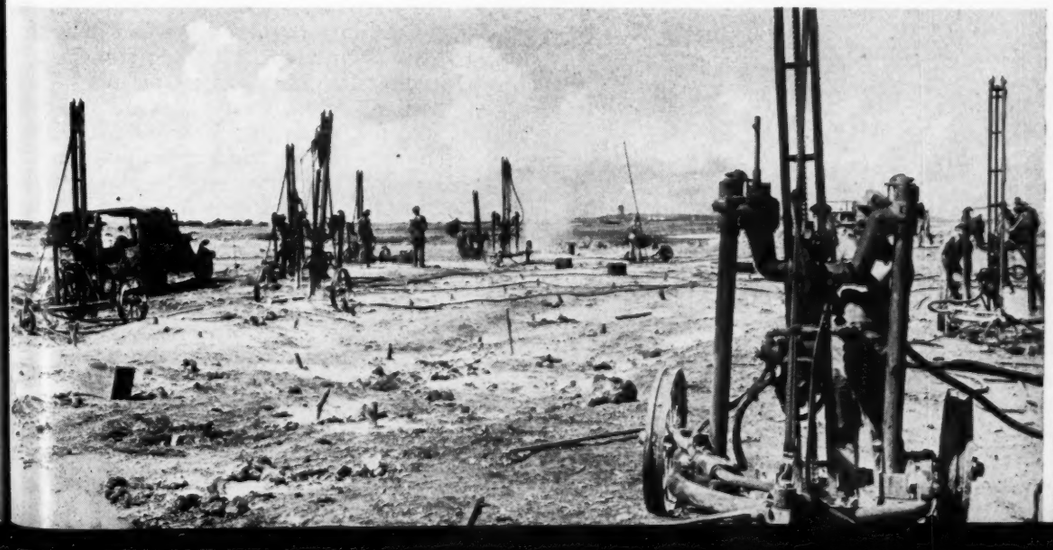
For the first time, the Aviation Engineers knew the full magnitude of the job ahead. Despite the shell damage, they had to put a fighter runway into operation immediately. Then, despite the difficult terrain and the fact that fighters would be using the field constantly, they had to build a 6,000-ft. runway for B-24 Liberators. While the Liberators were away on bombing missions, the runway had to be enlarged to a giant base from which B-29's could take off for Japan's homeland.

There was other work to be accomplished, too. The Aslito base, renamed Isely Field after capture by U. S. troops, was only one of three projects on Saipan; also to be built were a permanent fighter base and a field for Liberators. On Guam, under similarly adverse conditions, the Engineers were directed to build two B-29 fields and a big maintenance repair base. Meanwhile on Tinian two other B-29 fields were to be constructed by Navy Seabees—with four Aviation Engineer companies scheduled to help out later on maintenance. The first of these jobs, and the most difficult, was Isely Field.

Because of its size and weight the B-29 demands something entirely new in airfield construction. Its wheel load is 67,500 lb., the Liberator's 37,000, its gross weight being 135,000 lb., or approximately twice that of a Liberator. The B-29 requires a runway 200 ft. wide and 8,500 ft. long, an area almost twice as great as the 150x6,000-ft. strips used by Liberators. Other base facilities run in about the same proportion.

At Isely Field the final stage of development called for two parallel B-29 runways with 150-ft. shoulders; 6 mi. of taxiways; two 300x1,950-ft. service aprons (as large in area as most fighter strips); 180 hardstands, each 140 ft. in diameter, and 390,000 sq. ft. of warm-up aprons. About 30,000,000 sq. ft. of this area had to be cleared and graded, and about 10,000,000 sq. ft. paved. In addition, the Engineers had to provide

WAGON DRILLS (below, left) prepare large area for placing of 25 tons of dynamite in holes 8 to 14 ft. deep and 4 to 8 ft. apart which, when set off simultaneously, (below, right), shatter material to required depth of cut. Blasting work required is reflected in fact that 372,000 lb. of dynamite and 226,000 ft. of primacord are used.



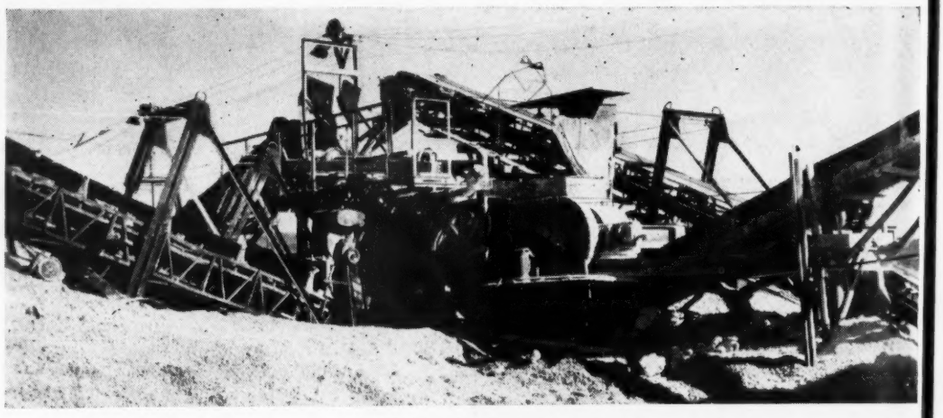
NECESSITY FOR ALIGNING 8,500-ft. Superfort runways within a few degrees of prevailing winds calls for fills up to 20 ft. and cuts of 17 ft. through solid limestone. Heavy rooters and dynamite are used to loosen material to be removed by large scrapers.

the facilities for storage of aviation gasoline.

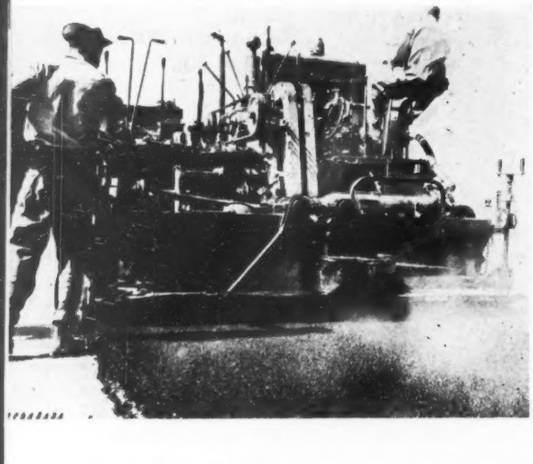
Terrain limitations permitted little choice as to location of the 8,500-ft. runways. For fighter planes and even for ordinary bombers, a runway can be shifted slightly out of line from the prevailing winds to avoid such obstructions as ravines or bluffs, but for B-29's the runway must line up with the winds within a narrow margin of error; the ravines must be filled and the bluffs cut down.

Japs Said Job Was Impossible

The Japanese, judging from their propaganda broadcast, believed that such a base could not be carved out of

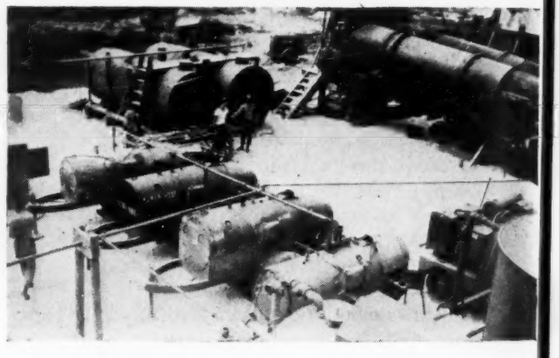


PAVER RECEIVES HOT MIX (below) directly from dump trucks and places 2-in. asphalt surface on 18-in. compacted coral base for B-29 runway at Saipan in the Marianas.



BELT CONVEYORS at crushing and screening plant stockpile material for asphalt mixing plant.

FOUR TANK CAR HEATERS, in foreground, circulate steam through overhead pipes to plant for melting solid asphalt from drums, to be stored in tanks in right foreground. Fuel tanks can be seen in left rear and dual-drum aggregate dryer in right rear.



THREE-TERRACED QUARRY (below), 2 mi. from runway, supplies 2,200,000 cu.yd. of coral for fill material. Shovels and dozers are kept busy by fleet of more than 150 dump trucks.

Saipan's coral rock. (Shortly after our Engineers went to work, they heard Tokyo Rose announce that the whole project was impossible. At the moment we were almost inclined to agree.)

Certainly the Japanese had done very little themselves, by U. S. standards, to exploit the island as an airfield. Aslito, as they left it, was only a small, graded area on which they had laid large limestone rocks by hand and then carefully inserted smaller rocks in the crevices. Over this surface they had simply spread a thin layer of coral sprayed with an even thinner layer of asphalt.

From construction equipment left behind, our Aviation Engineers could learn how completely the Japanese had relied on mere manpower. All the Japanese had were three tractors, five light

rollers, one scraper, one rooter and one 2½-yd. dragline. Two of the rollers were used on miscellaneous jobs before the Engineers could unload all of their own equipment, but the only thing which proved of permanent value was the dragline—a piece of U. S. equipment which the Japanese had captured at Guam!

Modern Construction Equipment Used

By contrast, our Engineers arrived in the Marianas prepared to apply all modern construction methods which could possibly be adapted to combat conditions. Each of the five battalions assigned to Saipan, the seven battalions on Guam and the four companies which eventually helped on Tinian, took along the usual carefully selected machinery called for by the standard table of equipment. Compromising between probable needs and shipping limitations, the Engineers decided to take along the following additional pieces of equipment:

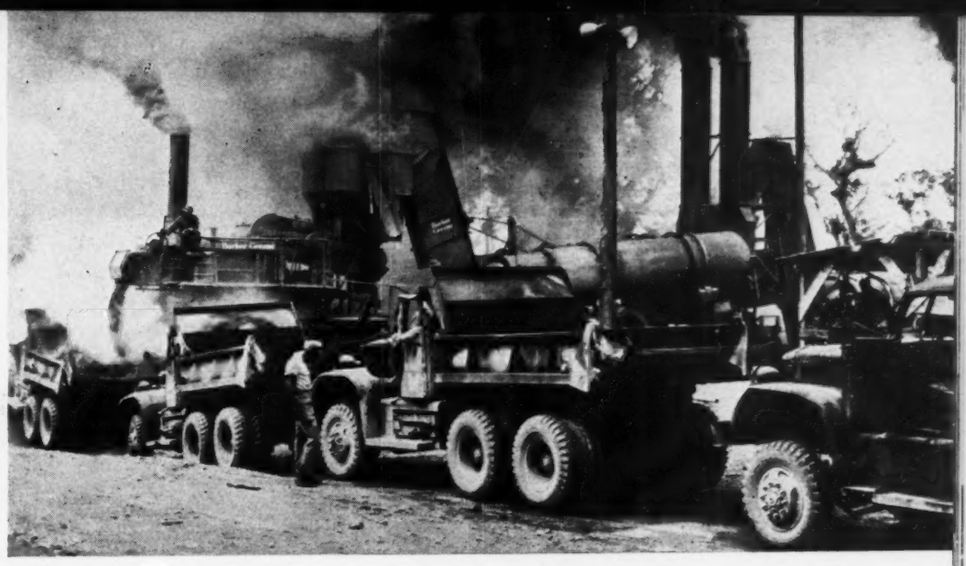
6 shovels, 1½-cu.yd.
55 dump trucks, 4-ton
15 scrapers, 12-cu.yd. and up
5 graders
25 tractors, D-8
4 rollers, 5- to 8-ton
10 rollers, 10-ton
5 sheepsfoot rollers, 2-drum
2 mobile cranes
2 rock crushers, (25-cu.yd. per hr.)
4 crushing and screening plants (150 tons per hr.)
2 asphalt plants (80 to 150 tons per hr.)

For the kind of work the Japanese had done on Saipan, this equipment would have lasted several centuries. For the kind of high-speed work the Aviation Engineers did it lasted barely long enough to finish the job.

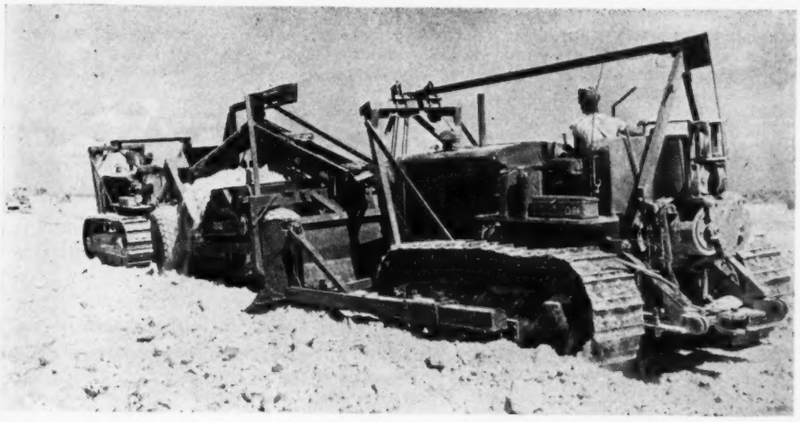
Development of Isely Field

Saipan's original share of equipment took 3 days to unload. Long before this chore was completed, the Engineers were on the job. The day after the landing, one crew was busy filling craters on

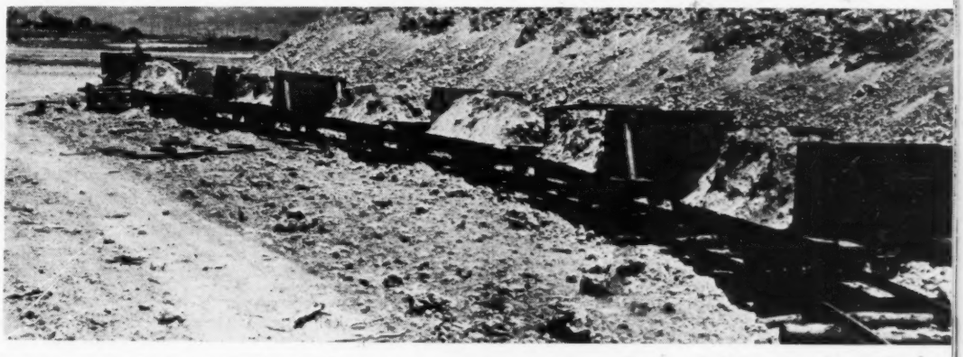
(Continued on page 156)



TRUCKS TAKE HOT MIX from plant operated by Aviation Engineers on Guam. More than 30,000 tons of crushed rock is mixed with 400,000 gal. of asphalt for surfacing runway and 3½ mi. of taxiway and hardstands in first phase of Guam's North Field construction.

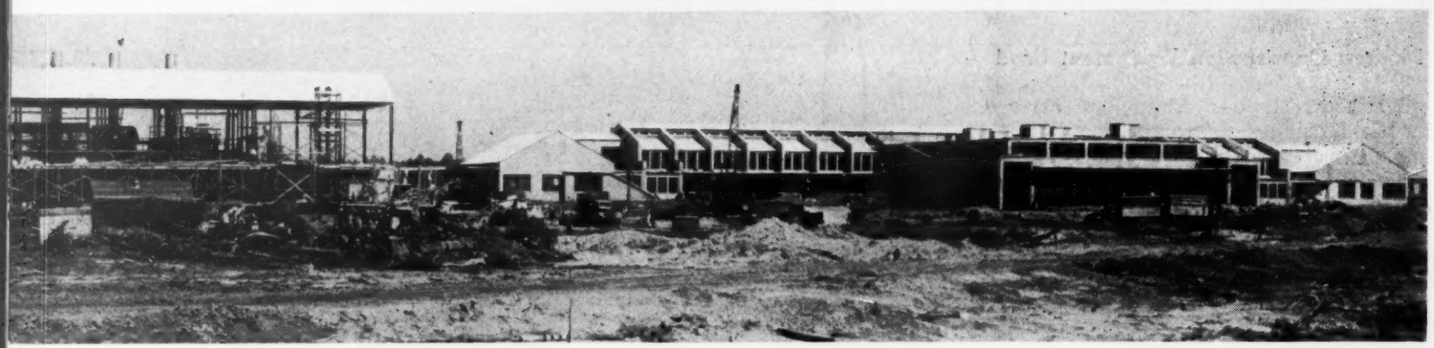


TRACTOR-DRAWN SCRAPER, with bulldozer pusher (left) aiding loading operation, contrasts strikingly with Japanese hand push carts (below) found at unfinished airfield on Saipan. Captured enemy construction equipment indicates how completely Japanese rely upon hand labor and archaic methods in constructing their airfields.



TWO ASPHALT MIXING PLANTS (below) on Saipan produce total of 185,000 tons of asphaltic concrete, an average of 1,400 tons per day.

Rocket Plant ROARS TO STRONG FINISH

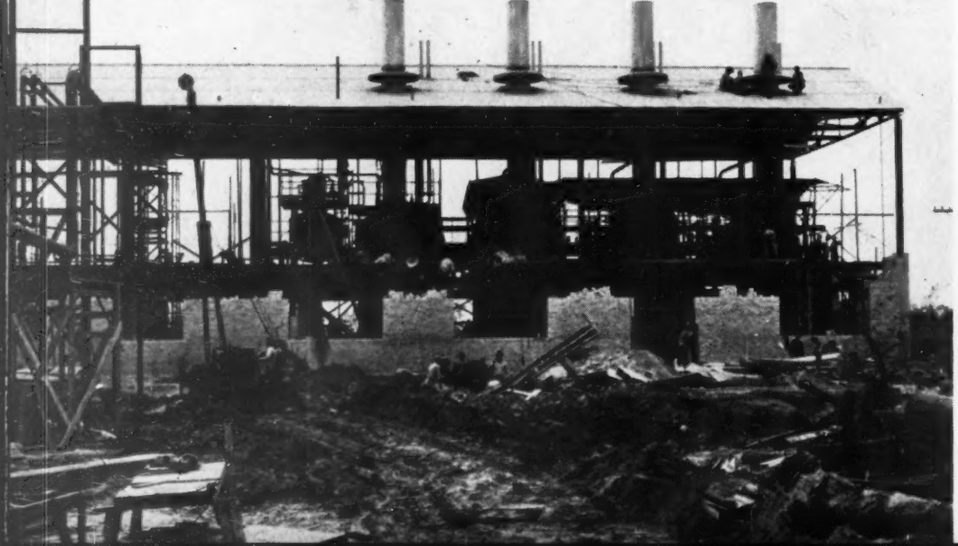


GROUPS OF BUILDINGS widely dispersed over 110-sq. mi. area make up plant for manufacture of rockets from component parts and materials shipped in by rail. This group is part of one unit for loading large rockets with propellent powder. Boiler house, at left, furnishes steam and compressed air for two loading units. Building at right, separated into compartments by massive concrete partitions, is connected by covered passageways to number of other smaller structures, hidden from view.

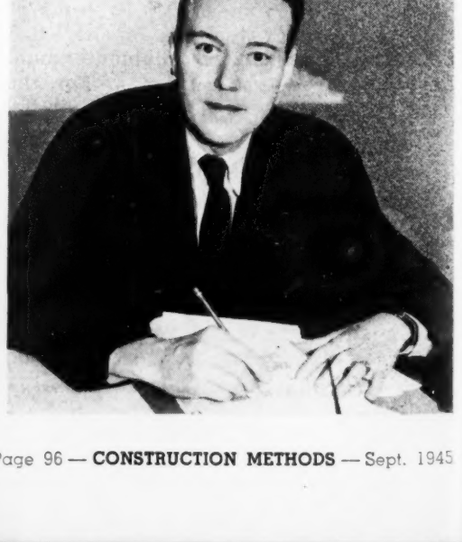
ROCKET PLANT CONSTRUCTION is directed for Navy Department, Bureau of Yards and Docks, by Comdr. JOSEPH WHITE (CEC) USN, officer in charge of construction.

GRIM DETERMINATION to keep the wheels turning through the deepest mud and water which Arkansas' worst winter could produce rewarded the resident officers of the Navy's Bureau of Yards and Docks and the civilian engineers, architects and contractors on the new $100,000,000 Naval Ordnance Plant near Camden, Arkansas, where these men had the pleasure of seeing rockets of various calibers loaded with explosives to shorten the Pacific War. The Navy and its contractors, principally the WHMS group well-known for other war jobs, between October and April bucked a full complement of normal and abnormal difficulties, of which the weather was the most persistent and pernicious, and the job ended the sixth month of a designated twelve-month construction schedule with the plant only 11 percent completed.

Even this fractional accomplishment represented the result of determined effort on the part of the entire project personnel during the winter, when conditions underfoot were at their conceivable worst. Structures and facilities of both permanent and temporary nature installed during that time made possible the early completion of the first production unit and laid the groundwork for rapid progress during the summer in the entire plant. As a result of the winter work, slow though it seemed at the time, the rocket plant made its scheduled re-



BOILER HOUSE (below) for two explosive-loading units of rocket plant contains four 250-hp. boilers fired by natural gas, with oil standbys to take care of any interruption in gas supply. Steel-frame building has brick closure walls and asbestos-cement roof. At left are pole lines for steam, air and return between boiler house and loading buildings.



AS CONTRACTORS' REPRESENTATIVE on project, A. A. FULLER (below) is responsible official in charge for WHMS combination consisting of Winston Bros. Co., Minneapolis, Minn.; C. F. Haglin & Sons, Inc., Minneapolis, Minn.; Missouri Valley Bridge and Iron Co., Leavenworth Kan. and Sollitt Construction Co., South Bend, Ind.

AFTER SLOW START IN WINTER MUD

HORIZONTAL LOOP in 10-in. steam line is fabricated on ground by electric welding with current from two sled-mounted gasoline-engine-driven generators at left, preparatory to being raised by tractor crane to pole hangers.

CENTRAL CORRIDOR of explosive loading building incorporates protective features designed to reduce danger of explosion. Heavy walls of plain concrete separate corridor from loading compartments on both sides. Air-operated rolling steel doors 1" in. thick run on bronze rollers on steel track and bring up against rubber stops; copper strips on concrete walls fend off doors from spark-making contact. These doors and all other steel, including anchor bolts, door and window frames, ventilating ducts, and reinforcement in footings are grounded. Lighting fixtures, motors and motor controls are all explosion-proof as defined by Board of Fire Underwriters; condulet, panels and circuit breakers are sealed. Non-sparking floor of this corridor (classed as more hazardous area) has ⅜ in. of magnesia oxychloride of 6,000 psi. compressive strength, placed separately on top of hard, rough-finished concrete. Sierra calcium magnesite is used in this building.

quirements as finally determined by the Army and Navy Board to satisfy the needs of the war against Japan.

Site Conditions

Early in October 1944, the Navy took over a 110-sq. mi. area in the pine bottom lands of the Ouachita River Valley and immediately launched a twelve-month program to convert the vast site into a complete and fully functioning plant for rocket manufacture. The site was largely wooded land, with flat slopes which provided minimum gradients for drainage. The soil over nearly the entire area consists of about 2 ft. of alluvial silt on top of excellent loam, classed as an A-2 soil in the PRA grouping. Bearing value for footing design was 4,000 lb. per sq. ft. Clay gravel suitable for road base and similar uses is found in a number of locations. These deposits provide a material containing 40 to 75 percent metal; the maximum plasticity index is about 5.

Existing roads on the site were entirely inadequate for construction traffic. The constructors built them up by adding 1 ft. of compacted clay gravel, scarifying the surface of the compacted material and applying 0.3 gal, per sq. yd. of road oil on a 24-ft. width. Permanent roads were constructed simultaneously with the rest of the plant, utilizing for the base clay gravel of 1-ft. minimum compacted depth. These permanent roads are to have a final paved surface 22 ft. wide

PLAIN CONCRETE PARTITIONS of substantial thickness, devoid of reinforcement, are typical of construction employed to compartmentalize buildings which handle explosives, leaving one side of each compartment relatively unresistant to permit controlled expansion of explosive gases in that direction. This loading building is completed during first six months of job, while dripping skies overhead and surface water underfoot continually hinder operations.

FREEDOM FROM DUST, primary safety requirement in handling and loading explosives in rocket manufacture, calls for continuous air change by means of two extensive duct systems, one to supply clean air and other to remove dusty air. Glass block helps to insulate this inhibiting building.

ADMINISTRATIVE SUPERINTENDENT on construction staff for Bureau of Yards and Docks is Comdr. VIGGO C. BERTELSEN (CEC) USNR.

BUTTRESSED BARRICADE sloped to deflect any possible explosive forces upward surrounds cooling building in line of structures where demolition explosive is prepared and loaded into head of rocket. In left foreground, concrete is being dumped from carts and screeded by hand on top of conveyor tunnel connecting buildings in this line. Roof, typical of all buildings in TNT lines, consists of 3½-in. reinforced concrete, 2-in. gypsum insulation plank covered with roofing felt laid in hot-mopped pitch, and final 2-in. concrete reinforced with wire mesh.

LESS HAZARDOUS AREAS in hazardous buildings are given monolithic metallic finish on concrete floors as protection against sparking. In accordance with specifications, dry mixture consisting of metal aggregate (free from non-ferrous metal particles), cement dispersing agent and pozzuolanic material capable of combining with free lime to form water-insoluble compound is applied to freshly screeded concrete surface at 90 lb. per 100 sq. ft., and floor is finish-compacted by motor-driven disk-type float.

TWO-CRANE TEAM sets steel for one of 38 storage buildings, 50x200 ft. in plan, to house inert components for rocket manufacture. Field connections are rivet-bolted.

CONSTRUCTION WORK, including equipment and field engineering, is under direct supervision of JAMES A. MORIARITY (below), operations manager for contractors.

GENERAL MANAGER for WHMS group, principal contractor for project on fixed-fee basis, is RAY V. JOHNSON, heading entire organization under Mr. Fuller.

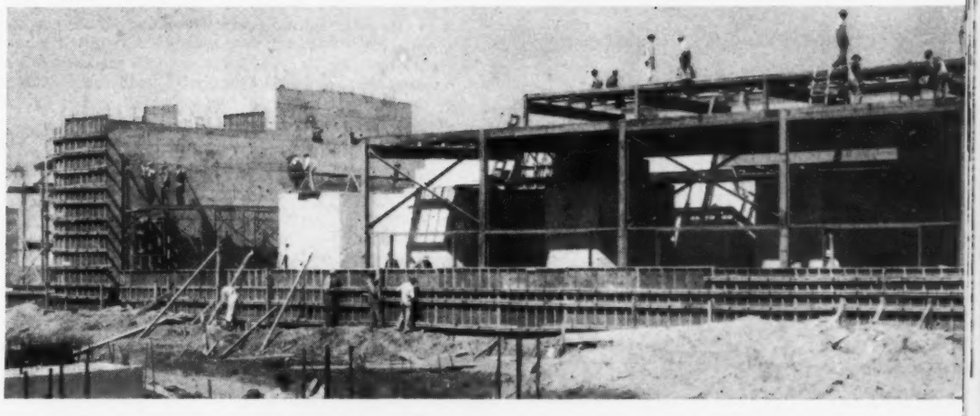
SUSTAINED RAPID PROGRESS marks repetitive operations by ten specialized crews in construction of 100 flat-top magazines for smokeless powder. Gasoline-powered rotary float puts hard finish on 190-cu.yd. floor slab placed in afternoon of first day of constructing the 50x100-ft. magazine.

and 2 in. thick of hot-mixed hot-laid asphaltic concrete put down in two courses. The contract called for a total of 100 mi. of roads, plus 4 mi. of streets and 25 mi. of sidewalks in a housing community built on the reservation for the operating personnel of the plant. This housing project provides 262 dweling units, in 182 one-story wood-frame housing project provides 262 dwelling under separate contract by FPHA.

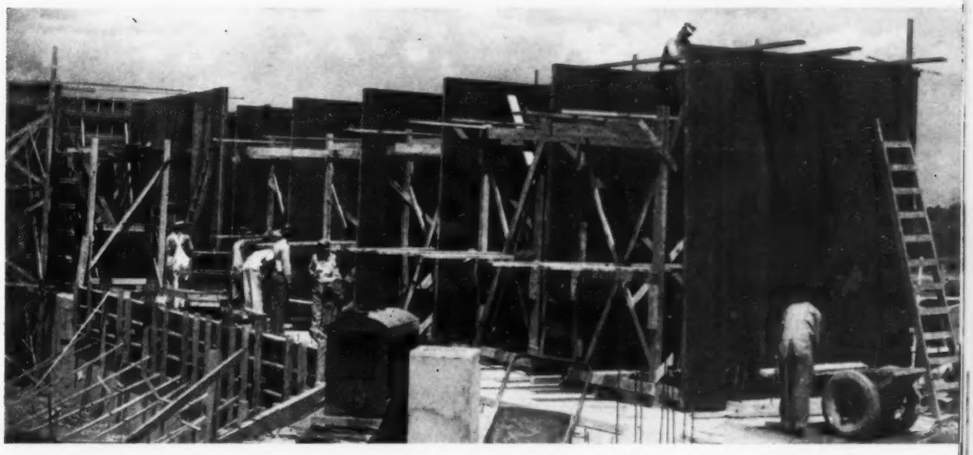
Rail connections to nearby railroad lines and spur tracks to serve the scattered units of the plant involved construction of 115 mi. of railroad track under the principal contract. One railroad, the Cotton Belt, passes the site, and a 3-mi. spur has been built connecting with the C.R.I.&P. Construction materials and equipment came in over these railroads.

First Requirements

At the outset, the Bureau of Yards and Docks entered into fixed-fee contracts with two firms for engineering and construction of the plant. Surveys and design drawings were to be made under one of these contracts by the Fraser-

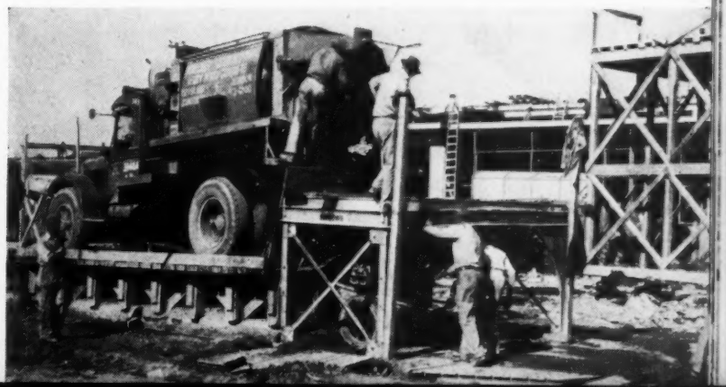


SAND-FILLED BARRICADE with 2-ft.-thick plain concrete walls (partly stripped of forms, being rubbed by workmen on scaffold at left) protects locker rooms and lavatories, beyond barricade, of this drilling building in TNT line from hazardous portion, where steel erection has progressed part way. In latter portion, note massive partitions of plain concrete dividing area into separate compartments.

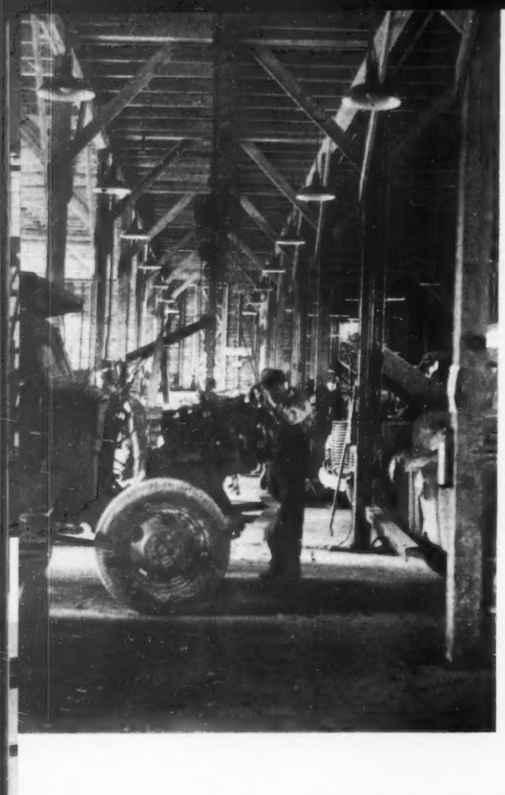


PLYWOOD FORMS of plycrete grade in prefabricated panels are characteristic of concrete construction on project. These panels are being set for massive, plain concrete partitions between working chambers of propellent loading building in small-caliber rocket production line.

CONTRACT SUPERINTENDENT (below) for Bureau of Yards and Docks is Comdr. C. E. SPELLMAN (CEC), USNR, veteran of several important Navy construction projects.



HAND CARTS transport concrete into building from two-gate hopper filled by truck mixer on ramp platform.



MORE THAN 1,000 JOBS, major and minor, every week in automotive repair shop are indicative of maintenance needs in fourth year of war on Navy project where contractors are using more than 4,300 pieces of equipment. Automotive shop handles gasoline-engine vehicles only; diesel-engine trucks are repaired by heavy equipment shop which runs up its own large weekly totals of work on tractors, cranes, excavators and comparable units. Tire shop is third leg of tripod which keeps project from falling down on schedule.

Brace Engineering Company, Inc., New York, which opened a design office and drafting room on the project to carry on this work. The second fixed-fee contract, for the construction of the plant, was with the WHMS combination made up of four firms: Winston Bros. Co., Minneapolis; C. F. Haglin & Sons, Inc., Minneapolis; Missouri Valley Bridge & Iron Co., Leavenworth, Kan., Sollitt Construction Co., South Bend, Ind.

A few facilities were available at the southwest corner of the huge site, near Camden, a county seat of 9,000 population. This corner of the area was occupied by a former municipal airport, Harrel Field, taken over and operated for a time by the Army Air Forces as a training field. The abandoned field provided a cleared and graded area with three paved runways about 1,000 ft. long, four barracks, an administration building, and two steel-frame hangars covered with corrugated metal siding. One of the hangars was put to use as a drafting room by the engineer contractor; the second was converted into an office by the construction contractor.

Two primary needs faced the Navy and its builders at the start of the project. One was the recruitment and housing of about 20,000 people required to push the project to completion at the specified time. The second was the prompt production of accurate topographical maps to assist the location of drainage lines, roads and other permanent structures.

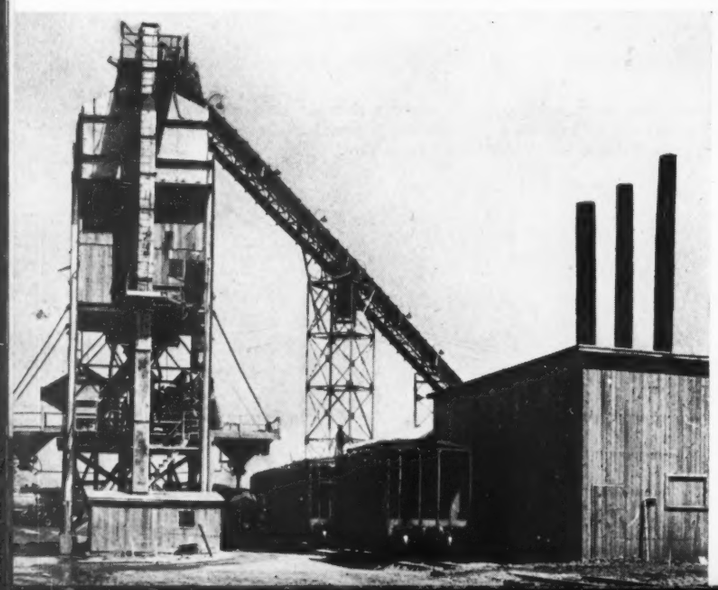
To meet the first requirement, the construction contractors erected a manual-

(*Continued on page* 140)

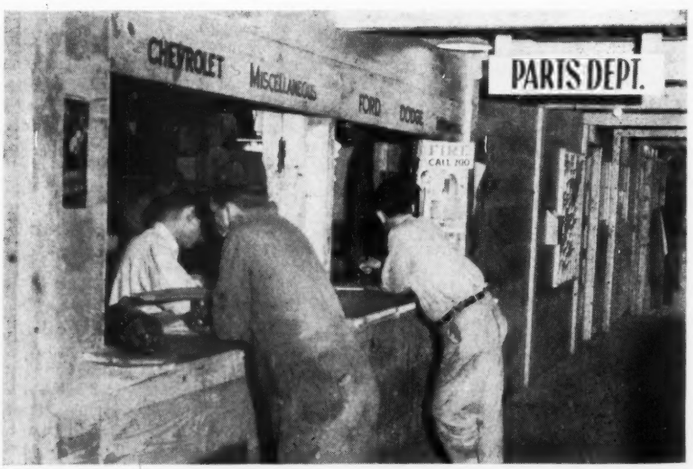
FOUR-WHEEL TRACTORS (below) pull loaded scrapers through soft ground in leaving clay-gravel borrow pit with material for road base. When loading, pneumatic-tired units receive help from similar outfits, equipped with pusher plates for purpose, or from crawler-type tractor-bulldozer.

NAVY FIELD MEN (below) get together to inspect construction on TNT line. Left to right, N. B. BARNETT, construction engineer for project; Lieut. T. R. SHAID, assistant contract superintendent; G. T. HOYT, principal inspector; JOHN E. ROBERTSON, inspector; CLYDE C. EVANS, inspector.

PRESHRUNK BATCHES (below) are charged into truck mixers at central batching plant by two 3-yd. tilting mixers set up under bin holding two carloads of gravel, two of sand and one of cement. All concrete ingredients, including water, are weighed by automatic electric control.



TIME LOST IN LAY-UPS is dependent upon stocks available in parts department. Automotive shop (below) sets up this window to give fast service to mechanics working on gasoline-engine trucks and passenger cars.



JOB oddities

BURIED WOODEN PIPE (below) apparently used for water main in 1870's at Studebaker plant in South Bend, Ind., is unearthed during demolition for new construction to speed manufacture of trucks and cars, as noted elsewhere in these pages. BRADLEE TRUDEN, general superintendent on $2,500,000 project for Giffels & Vallet, architect-engineer, Detroit, checks 8-in.-dia. bore in 14-in. solid cypress logs 8 ft. long, turned down ½ in. at ends for sleeve joints. S. N. Nielsen, Chicago, is contractor for job.

SAWMILL IN NORTH BURMA is constructed by SGT. BEN V. BARNETT, U.S. Army, from wreckage of bombed-out sawmill, wrecked trucks, and parts from blasted Myitkyina-Mandalay Railway. Signal Corps Photo

MAGNETIC ROADSWEEPER (below), developed by Seabees to remove nails and metal scraps from roads and thus reduce tire repairs, consists of salvaged material mounted on jeep chassis, with tow bar and steering rods added. Power for electromagnets is supplied by 1½-kw. dc. generator operating at 90 v. and driven by gasoline motor. Magnetic sweeper bar consists of three 6-ft. lengths of dozer blades welded together to form laminated bar of three layers.

MINE EXPLODER FRAME attached to dozer blade of armored tractor permits lifting of booby-trapped land mines on Okinawa with speed while providing relative safety to removal crews. Detectors locate mines which are engaged by grapple at end of frame.

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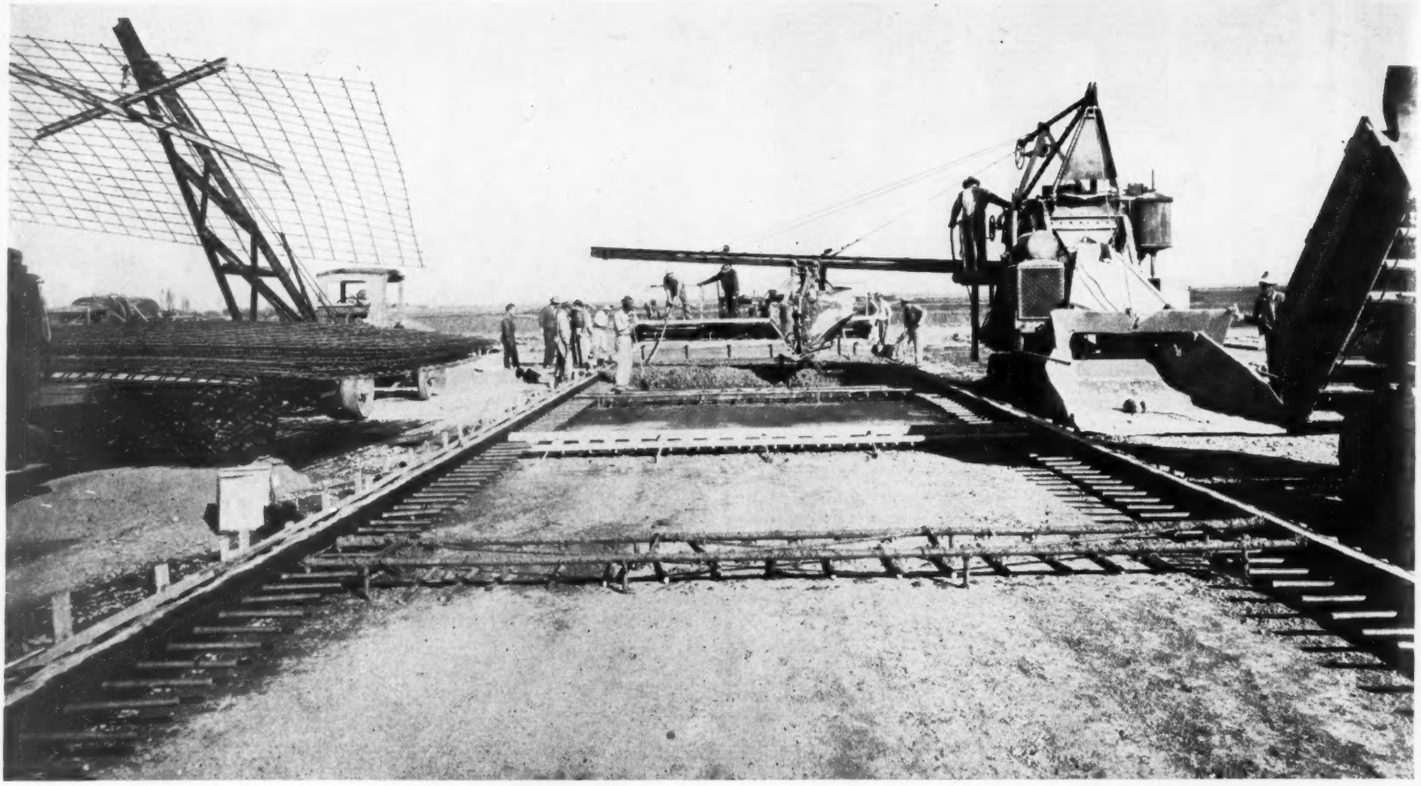
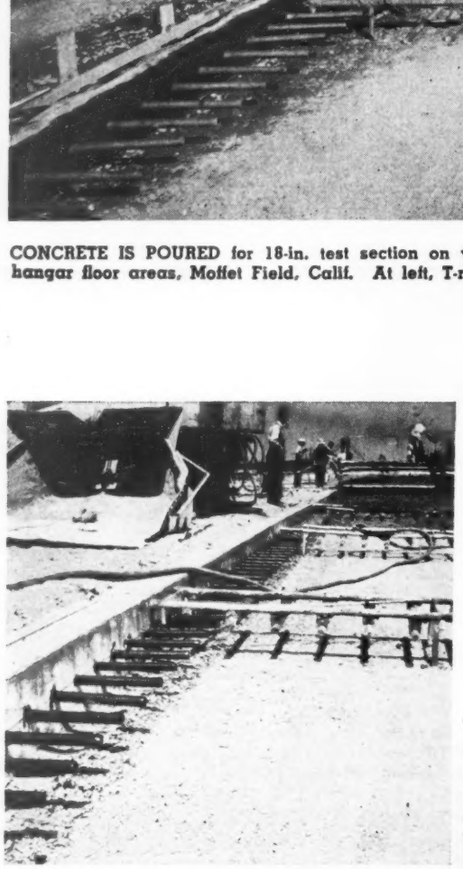
CAMP MEETING (below) in Milwaukee finds mourners' benches occupied by not-too-mournful Koehring sales engineers and service men who hear gospel preached on proper assembly, operation and maintenance of equipment. Held in circus tent, meeting featured "sideshows" of new machinery.



CONCRETE IS POURED for 18-in. test section on well-compacted 24-in. base to support concentrated wheel loads of 175,000 lb. in warm-up apron and hangar floor areas, Moffet Field, Calif. At left, T-rail spreader lifts panel of ½-in. temperature steel used in upper part of slab.



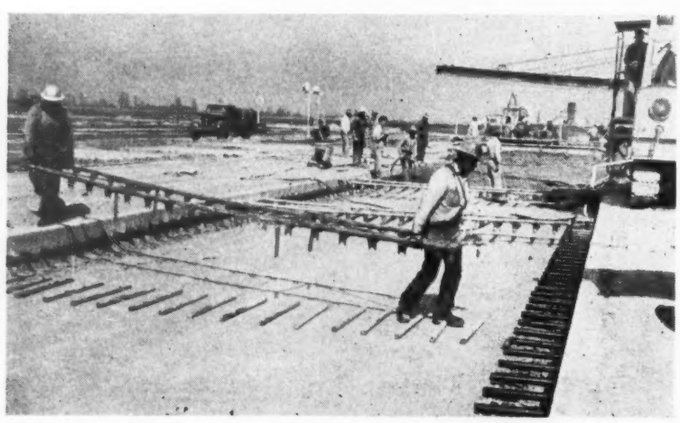
HEAVY STEEL DOWELS, 36 in. long with 2-in. dia., carry shear at joints between 18-in. slab units.

Heavy Concrete Test Section

Constructed for 175-Ton Planes

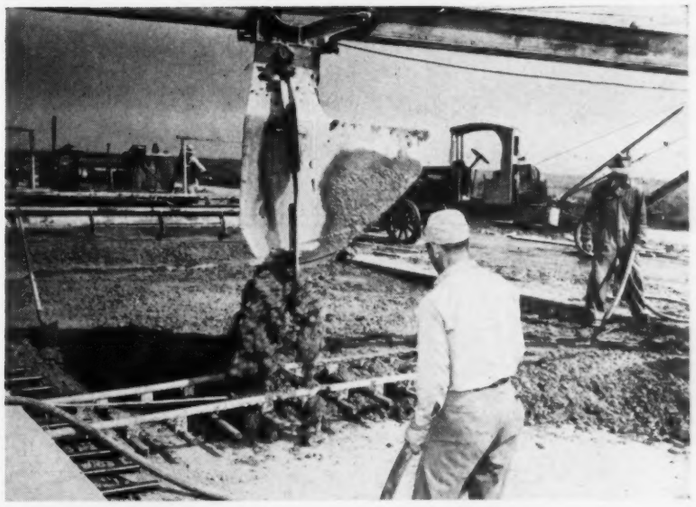
CONCRETE PAVING OF VARIOUS THICKNESSES, ranging up to 18 in. for the heaviest aircraft now proposed, has been laid in the hangar and warmup apron areas of Moffet Field, Calif., by the Ames Laboratory of the National Advisory Committee for Aeronautics. Vibration incidental to warming up and particularly to "revving" up the motors while a plane is stationary is believed to put a more severe load on the pavement than that imposed by normal landings and take-offs. In addition to the 18-in. slab, adjacent areas were paved with concrete of 12- and 9-in. thicknesses, in accordance with expected loadings, forming one continuous slab. Observed performance of these test slabs will help correlate design theories with actual results.

A pavement designed to support the heaviest airplanes, including the recently announced giant 175-ton passenger liners, was constructed in the hangar area. The subgrade in this area consists of a heavy black, humic alluvial clay which is subject to severe swelling on absorption of moisture and which, when



WELDED-PIPE JIG, for holding contraction joint dowels in exact alignment at mid-slab depth while concrete is poured, is moved forward. Dowels are placed on subgrade at 12-in spacing for wiring on to jig. After concrete is placed wires are cut and jig is removed without disturbing dowels.

STEEL REINFORCEMENT, consisting of ½-in. rounds at 12-in. centers, is tamped into place 2 in. below finished surface of slab. Jig in foreground holds contraction joint dowels in place while concrete is placed.



PORTABLE, gasoline engine-driven, bayonet-type vibrators spread and work mix ahead of finishing machine as concrete is discharged from bucket of Koehring mixer.

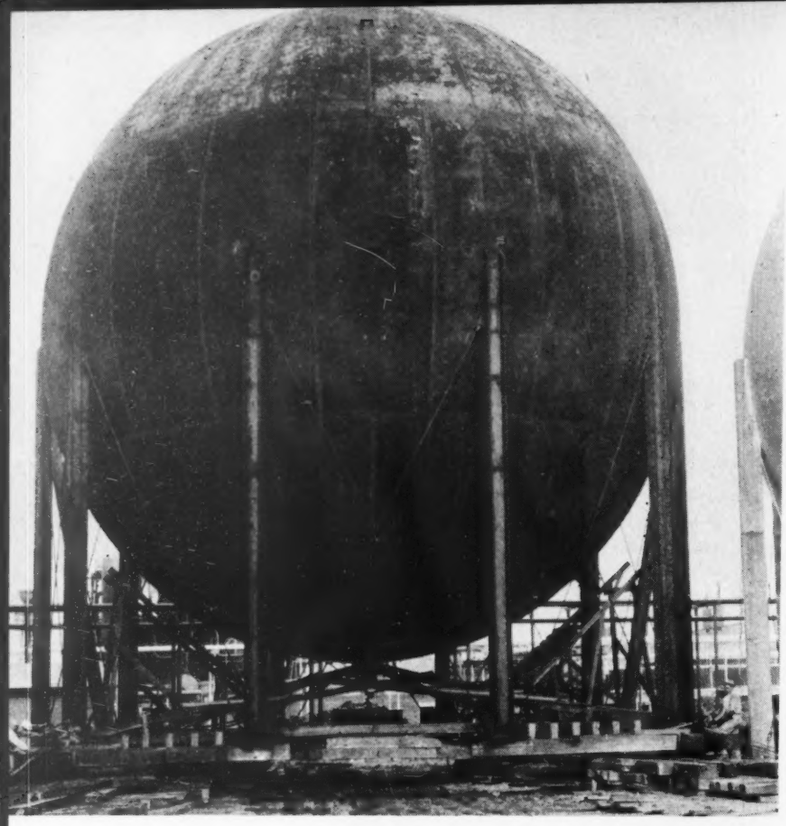
moist, is quite plastic and inclined to flow. The paving laid on this low-bearing-value soil will have to support a load greater than that imposed by the hangar structure itself, concentrated loads resulting from 260-ft. span roof trusses at 40-ft. spacing.

To support a load of 175,000 lb. concentrated on each of two main wheel groupings, the design called for a foundation of 24-in. thickness of firmly-compacted subgrade, and an 18-in. slab of concrete; the foundation of imported fill to be laid in four 6-in. layers and the concrete to have a 28-day strength of not less than 4,000 psi. Reinforcing would be only such as should be provided for temperature stresses, and vertical shear at joints between 20-ft. slabs was to be distributed by steel dowels. Steel rounds of 2-in. dia., 36 in. long—extending 18 in. into each adjacent slab—were placed on 12-in. centers.

Concrete paving in adjacent areas of 12- and 9-in. thicknesses, was designed in accordance with expected loadings, and formed a continuous slab with the 18-in. paving. Dowels in contraction joints of all three thicknesses were 36 in. long and were placed on 12-in. centers, but varied in diameters.

(Continued on page 176)

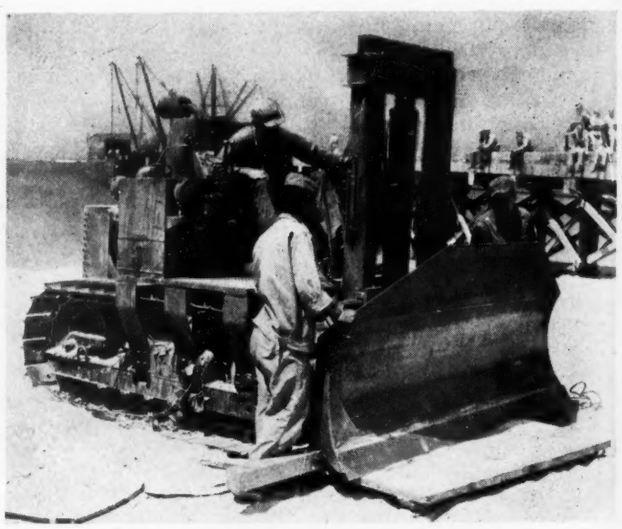
FINISHED SECTIONS OF PAVEMENT are diked and ponded for curing (left background). After two passes of Jaeger-Lakewood finishing machine (foreground) pavement surface is given five successive hand-finishing operations.



HOW They Did It

CONSTRUCTION DETAILS For Superintendents and Foremen

MOVED 500-FT on steel pipe rollers including 90-deg. turn, from gas-free area safe for welded fabrication 264-ton Hortonsphere 51¼ ft. in diameter is placed on permanent foundations by Chicago Bridge & Iron Co. for storage of isobutane. Runners made up of three spliced 12x12-in. timbers, braced by 8x8-in. struts, support sphere during fabrication and moving. Seven-part falls hooked up to Sullivan hoist pull front end of each runner, and triple-drum American hoist at rear controls backward movement when necessary.



RUNNING BACKWARDS, International Harvester tractor (above, left) uses forks to jack up rear end of 1½-ton truck bogged in sand on Hawaiian beach and pushes it to firmed ground with aid of 20-in. track shoes. Drive bevel gear is reversed from normal position to reverse speeds of tractor. Hughes-Keenan high lift (above, right) is hydraulically operated. Forks are lifted by two chains fastened to movable fork supports and fixed cylinder channels. Signal Corps Photo

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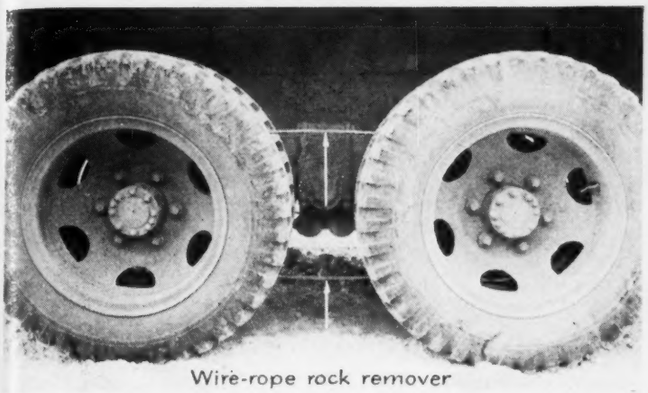
DOUBLE DUTY in street stripping is accomplishment of Michigan truck-mounted shovel (below, left) belonging to C. W. Blakeslee & Sons, Inc., New Haven, Conn. Using dipper teeth, shovel first tears up old asphalt and loads chunks into trucks under direction of MIKE SULLIVAN, in felt hat, who has worked for four generations of Blakeslees. Teeth then are covered with bolted plate of ½-in. steel (below, right) for cleaning up fines and dumping them into trucks.

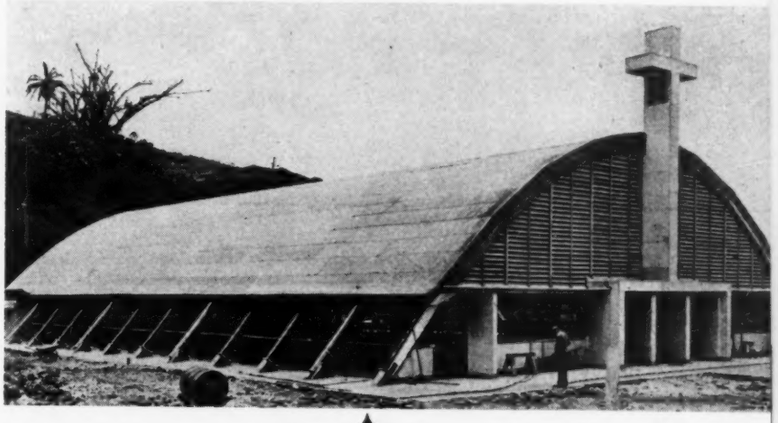


Wire-rope rock remover

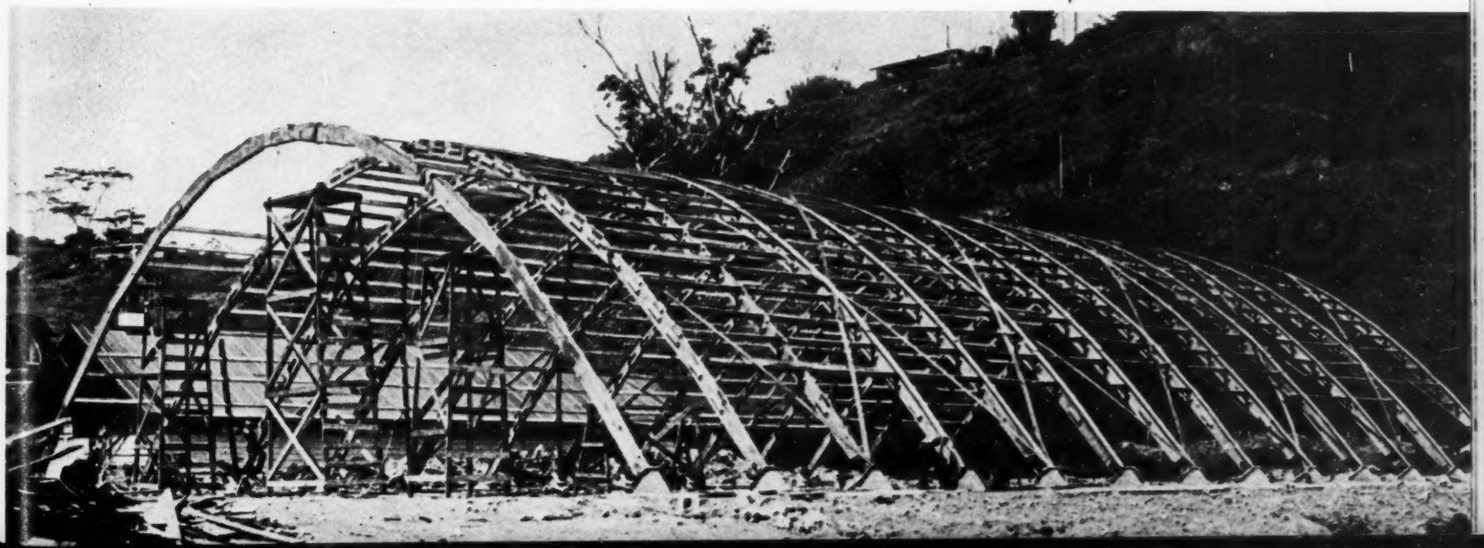
INTERCEPTOR consisting of wire rope loop inserted between dual wheels of tandem-axle drive keeps coral fragments from lodging between tires of Seabee trucks in Western Pacific. Seabees choose ⅝-in. rope of preformed type for easier splicing, free of cranky wires which rub tires.

PLATE GLASS WINDOW, 19 ft. long and 10 ft. high, is installed at West Chester, Pa., plant of Schramm, Inc., by means of 16-ft. boom attached to lifting mast of Towmotor. This special boom, together with three-part cable dead-ended to horizontal arm, provides overall lifting height of 26 ft.

CALCIUM CHLORIDE SOLUTION is used in place of air to inflate tires of farm and industrial equipment (below). Filling tubes 100 percent with liquid solution is recommended by The Goodyear Tire & Rubber Co. for tires of vehicles, such as road graders, power mowers and industrial tractors, which carry only weight of vehicle and travel at relatively slow speeds. Its use provides more weight for wheels.



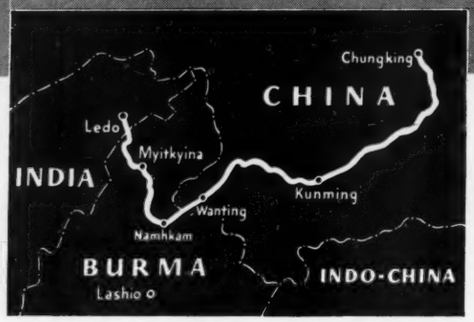
QUONSET HUT PRINCIPLE is used by Navy's Seabees in building chapel (above, right) in Pacific area. Overall dimensions are 80 x 155 ft. It consists of built-up wooden arches of 80-ft. span, spaced 10 ft. on centers, with 15-ft. arch spacing for chancel section. Arches are made of ordinary dressed lumber nailed together and erected with aid of crawler crane. Skeleton (below) shows temporary props set at quarter points of arches to prevent deflection during placing of 45-deg. diagonal sheathing.



Maintenance Under Traffic

BUILDS UP STILWELL ROAD

By LT. COL. W. L. O'DONNELL
Corps of Engineers
U. S. Army



COMPLETION OF THE STILWELL ROAD early this year and entry of American supplies into China over the new overland route, after a 3-yr. blockade by the Japs, were heralded in the United States. But most of the people back home who were justly proud of this enormous achievement by Americans in the jungles of Assam and Burma are only vaguely acquainted with the tremendous task of maintaining it. That's the job the Army is doing in the jungle today and will continue to do as long as America continues to send supplies to China over the 1,080-mi. highway.

The Stilwell Road, built on a variety of foundations, twists its way through hills and low jungle country where natural drainage is poor. Meticulous surveying, testing of soil and the application of other sound engineering principles would obviously have produced an even better road, but there was a tough war on and the utmost speed consistent with practicability and reasonable safety was essential. Such a situation often resulted in what the men on the road call "eye engineering" but it produced a usable road.

Engineer troops and other units now assigned to road maintenance are today

← **ARMY SAWMILL INSTALLATIONS along Stilwell Road furnish timber for pile bridges which are replacing many Chinese-built hewn-timber structures. Here Burmese labor stacks lumber.**

LOGGING OPERATION (below) in Burma utilizes improvised derrick consisting of boom rigged on tree for loading trucks. Trees are felled by axe or gasoline engine-driven chain saws and trucked or dragged by crawler tractors to sawmill.

SURVEY CREW (below) sets line for pile bridge designed to withstand heavy monsoon rains and increasingly heavy traffic of Stilwell Road.

MODERN STRUCTURE replaces old log bridge constructed by Chinese Engineeers with primitive equipment. Weakened by monsoon rains, old bridge failed under heavy loads it had to carry.

going over the road and doing the things they would like to have done a year ago when they were battling with time. A steady stream of military convoys now rolls on to China, and "eye engineering" has been discontinued as improvements in alignment, grade, surfacing and drainage make the road safer for constantly increasing traffic.

One of the outstanding outfits engaged in this work is the 45th Engineer General Service Regiment. As the name implies, it's a regiment that takes on a variety of jobs, comparable to a big civilian construction firm. Some of the men in the outfit remark smilingly that a lot of civilian contractors wouldn't even submit bids for some of the jobs they've had to take on. And some of the largest contractors aren't equipped for the varied work this regiment is doing.

Timber Production—One company in the outfit includes many men who were loggers back in the States. There's plenty of timber in Burma and the Army needs lots of it for the road. Known as Hu-Lung, the timber is available in two varieties, white heart and red heart. White heart rots rapidly and is never used for bridges, underpinning or simi-

SUBSTANTIAL STRUCTURES are gradually replacing crude bridges built at time when sound engineering principles gave way to speed consistent with practicability and reasonable safety. Causeway (above) crosses crude hewn-timber bridge which has begun to fail. Bridge of three H-20 steel trusses (right), supported on pile bents and braced laterally, with timbers, is one of many improved structures which carry heavy China-bound traffic.

WASHOUT which held up traffic for several days is repaired by Engineer troops with aid of Indian labor crews.

lar purposes. Red heart is quite rot-resistant and makes excellent structural timber.

The trees are felled with axes and with chain saws driven by gasoline engines. Some of them are 72 in. at the butt and shoot upward 100 ft. to the first limb. Felling completed, the logs, which weigh about 95 lb. per cu. ft., are dragged by crawler tractors to an unusual Army installation—the sawmill. One of the saws, 60 in. in diameter, is driven by a D-13000 Caterpillar diesel engine. Other saws in the mill are driven by engines removed from Army trucks.

Gravel Supply—Obtaining a constant supply of gravel for the road is a problem for the 45th Engineers. Material from shallow river bottoms or from high gravel bluffs which sometimes form on river banks is used to repair damage to the road surface caused by almost ceaseless traffic of heavy vehicles in large convoys. An 8-cu.yd. carrying scraper drawn by a crawler tractor takes the material from the river bottom, and a ½-cu.yd. power shovel loads it on to waiting trucks.

The road gets such a terrific pounding from heavy military traffic that it is necessary to regrade some sections twice

(Continued on page 192)

← GRAVEL TAKEN FROM SHALLOW RIVER BOTTOM by 8-cu.yd. tractor-drawn scraper helps solve problem of maintaining constant supply of road material.

→ 6-FT.-DIA. CORRUGATED METAL CULVERTS replace many bridges where volume of drainage is not too great.

SPEEDS OF 5 MPH. are maintained over 10 mi. of corduroy road while repair work proceeds on right-of-way at left.

MEN RESPONSIBLE FOR PLANNING AND EXECUTION of construction project shake hands at tree raising ceremony with workers who are erecting structure. Left to right: CHARLES W. KNOWLES, vice president, and WILLIAM COLLINS, president, Walter Kidde Constructors, Inc.; WILLIAM BROWN, vice president, and J. E. POOLE (in background), assistant chief engineer, Liquid Carbonic Corp.

RAISED BY WORKMEN to highest point on structural steel frame of industrial building, green roof tree marks culmination of frame erection and calls down heavenly blessings upon building.

Roof Tree Raising

CROWNS TOP LIFT OF BUILDING FRAME

CARRYING FORWARD a tradition which developed deep in the past and which in modern times has marked every building job erected during the 45-year history of Walter Kidde Constructors, Inc., New York, the firm on July 16 raised a green roof tree and fastened it to the highest steel in the frame of a new 100-ton dry ice plant for the Liquid Carbonic Corp. at Belleville, N. J. Ceremonies arranged by the contractor for the occasion were in keeping with the significance of the roof tree custom. Appropriate remarks and a constructors' prayer, adapted from a book of verses popular in the 19th century, were read by William Collins, president of the building organization, and were supplemented by expressions of similar nature from William Brown, vice president representing the owner, before the party turned to the conviviality fitting a function of this kind.

THE CONSTRUCTORS' PRAYER

This frame stands strong on every side
Yet open to the sky,
Pray let Thy bounteous blessings fall
Like sunshine from on high.

Masterbuilder of the World, Thy beauty,
Thy skill we now entreat
Thy blessings in abundance
To make our task complete.

May this plant know only plenty,
Wise direction and happy crew;
Within these walls may prosperity reign
To each give his just due.

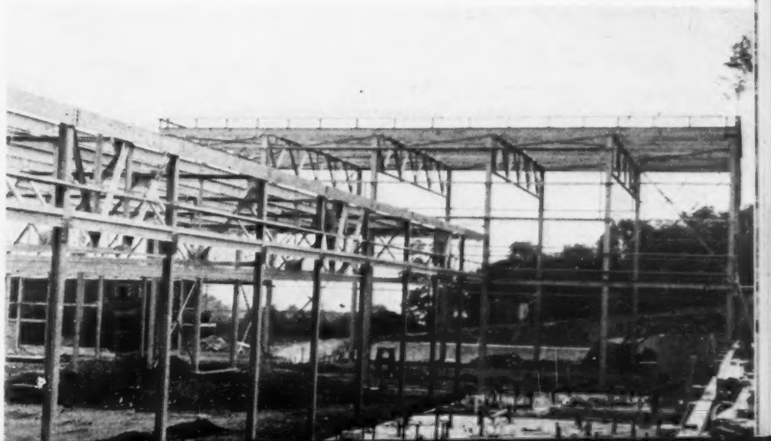
May this great structure yield its best
Beyond our greatest plans
And the product serve consumer well
Increasing his demands.

And now we ask of Thee, O Lord,
One last and earnest boon—
Bless hearts and hands in this great work,
Keep them with Thee in tune.

Copyright by Walter Kidde Constructors, Inc.

SHARING FESTIVE SPIRIT which marks occasion are these participants in project: Left to right, below, WALTER L. KIDDE, treasurer; E. WARREN BOWDEN, vice president; JOHN C. FINK, superintendent, and ANTHONY RINALDI, labor foreman, all of Walter Kidde Constructors, Inc.

WITH ROOF TREE RAISED to top position on steel frame (below), factory building emerges from first stage of erection ready for inclosure with roofing and siding.



BANK PULLING MACHINE consisting of side winch and boom attachment on wide-gage tractor solves problem of removing trees from TVA reservoirs. Screen protects operator from back lash of broken cable.

Mechanical Aids Cut Cost of Clearing TVA RESERVOIRS

By HOWARD ELLIS DAVIS

Division Superintendent, Reservoir Clearance Div.
Tennessee Valley Authority
Chattanooga, Tenn.

STIFF-LEG A-FRAME attached to bank pulling machine supports boom which gives sufficient lift to butts of trees to prevent bank gouging.

IN PREPARING RESERVOIRS for the 16 dams built by the Tennessee Valley Authority on the Tennessee River and its tributaries, nearly 200,000 acres of forests had to be cleared. Thousands of miles of streams threaded the reservoir sites and practically all of their banks were wooded. In clearing these stream banks, every tree that leaned over the water presented a problem. It had to be kept out of the stream when cut or, if it fell into the water, it had to be taken out for piling and burning.

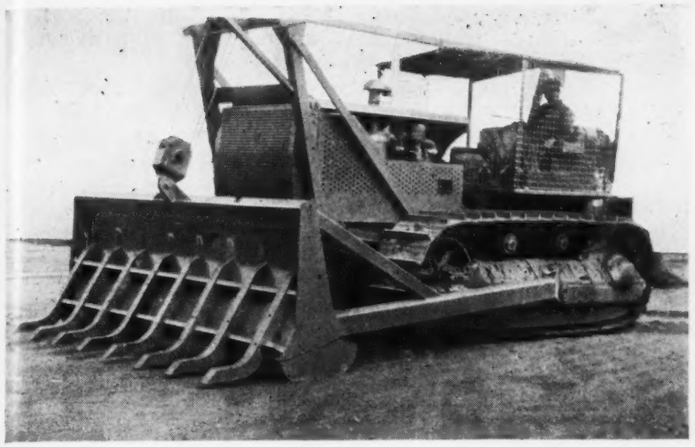
Hand Clearing Method—Swinging the timber shoreward by hand methods meant fastening one end of a small wire cable well up in the tree and anchoring the other end. Then, by skillful sawing and judicious wedging, the tree swung clear of the stream. If the tree leaned at too sharp an angle, the cable was supplemented with tackle and a crew stood by to pull on the fall line as the tree was cut.

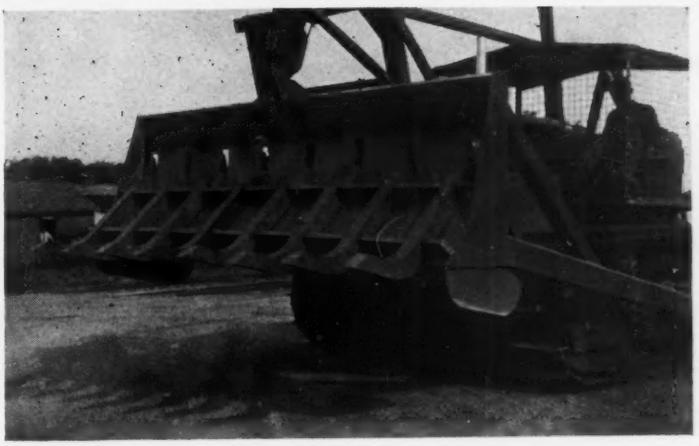
TVA RESERVOIR CLEARING

Comparison of Labor Consumption in Man-Days Per Acre

Regular clearing	16.6
Bank clearing, large trees	22.5
* * *	
With timber rakes, flat terrain	8.0
With timber rakes, bank clearing	15.0

← LEANING TIMBER is allowed to fall into streams from which it is easily removed by bank pulling machine. Old hand clearing method called for skillful and laborious manipulation to swing trees clear of stream. Man in foreground is guiding timber out of stream by throwing cable over stump.

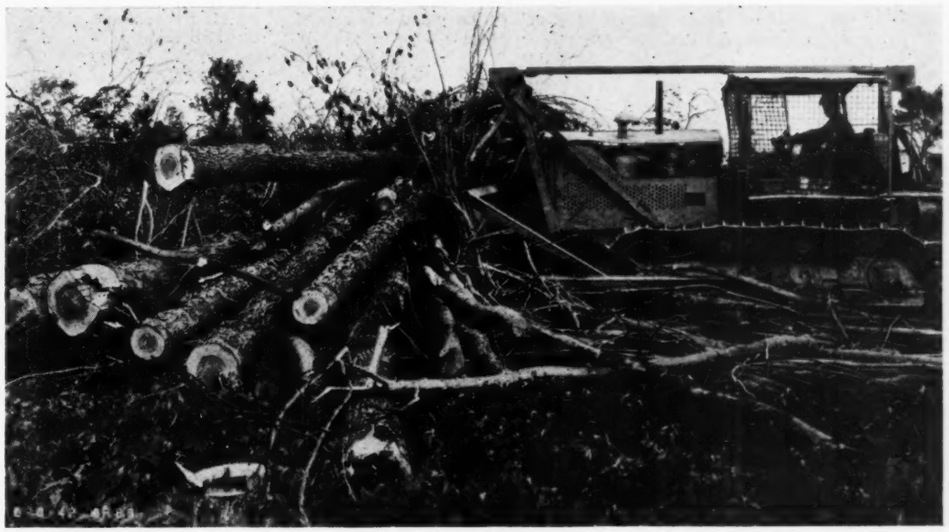




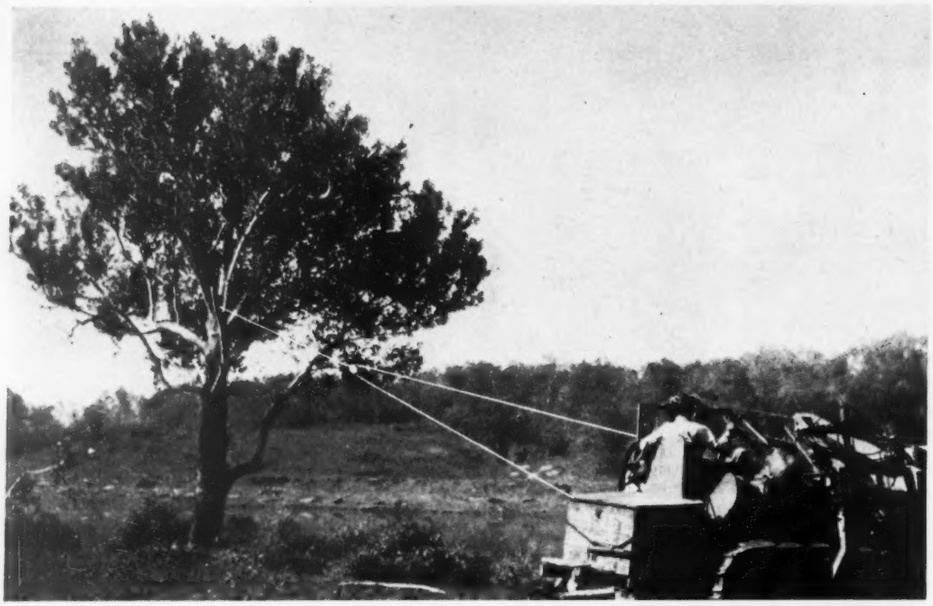
POWER TIMBER RAKE developed by TVA has curved teeth hinged in slots in bulldozer blade. Barge-shaped steel slides at each end of blade prevent teeth from digging into ground when operating in lowered position (left). In raised, or travel position (right), timber can be lifted over obstructing stumps. Number of teeth later is reduced to three.

This method was slow and expensive, but it had to be used when stream banks were inaccessible to equipment. Where possible, on most of the stream banks, the logical method was to drop the trees into the water, then draw them out.

In some of the mountain reservoirs, where the leaning timber was not excessively large, this procedure was successfully followed, using small crawler-type tractors equipped with rear-mounted towing winches. But on the Tennessee River and some of its tributaries, where the timber was larger, other provisions had to be made. This fact was particularly true along the Tennessee, where swamplands stretched on both sides of the river. Here, along the banks, grew giant sycamore, gum, beech, cottonwood, cypress, and spreading oak; and it was the rule rather than the exception for the trees to lean over the water. This condition prevailed not only along the main stream and its tributary creeks



TIMBER FOR POWER RAKE is felled in one general direction (below) and stumps are cut close to ground to facilitate windrowing for burning. Cage to protect operator of power rake (above) is made of No. 6 woven wire screen with 2-in. mesh.



DIRECTION OF FALL of giant sycamore at top of steep bank is controlled by side winch and cable, thus saving difficult removal job.

MOST EFFICIENT OPERATION is obtained with machines working in pairs. Here timber rakes hammer load of debris into windrow.

and small rivers, but along the many sloughs that wound their sluggish way through the great swamps.

When the Reservoir Clearance Division, the agency of the TVA which prepared the reservoirs for flooding, began work in Wheeler Reservoir, one of the first of those cleared, it discovered that the job lay in a setting of vast swamps. The superintendent in charge, Pat A. Miller, therefore faced a problem in developing a piece of equipment that would efficiently remove the leaning trees along the banks. A machine powerful enough to do the work was necessary; but it had to be light enough to negotiate soft ground and to cross the many temporary bridges which already existed or which, without too much cost, would have to be constructed to carry the equipment. The machine had to be sufficiently streamlined to thread its way through the mazes of the swamps.

Bank Pulling Machines — Standard-gage 35 tractors were procured for the job; but it soon became evident that this tractor's drawbar pull was not sufficient to drag the larger trees out of the water, and there were constant delays because of butts gouging into the bank. A side winch added the necessary power, but a lifting effect was needed, to overcome gouging and a 17-ft. boom was installed. Thus, each machine consisted of a Caterpillar 35 tractor, a 17-ft. live boom mounted on a sub-frame rigidly attached to the side of the tractor, and a winch with two multiple-speed drums placed opposite the boom to maintain correct weight distribution and to insure complete visibility for the operator—a type of machine often employed in pipe laying.

Its performance was only fair. With the heavy drag, as well as the lift, often taxing the capacity of the machine to the utmost, it constantly tilted. Counter-

(Continued on page 182)

TIMBER PULLED on to bank by bank pulling machine and raked into neat windrows by power timber rake is seasoned for burning.

Present and Accounted For... A PAGE OF PERSONALITIES

RECONVERSION PROBLEMS of construction industry will be responsibility of **HUGH POTTER**, who has been appointed Federal Construction Coordinator by War Mobilization and Reconversion Director John W. Snyder. President of River Oaks Corp., of Houston, Tex., Mr. Potter is past-president of National Association of Real Estate Boards and of Urban Land Institute. He is chairman of Houston's Post-War Planning Committee.

APPOINTED CHIEF ENGINEER of New York City Board of Transportation is **JAMES H. GRIFFIN**, who has since 1912 served as junior engineer, assistant engineer, division engineer and deputy chief engineer with this board and its predecessors. At 55, he is youngest man ever named chief engineer.

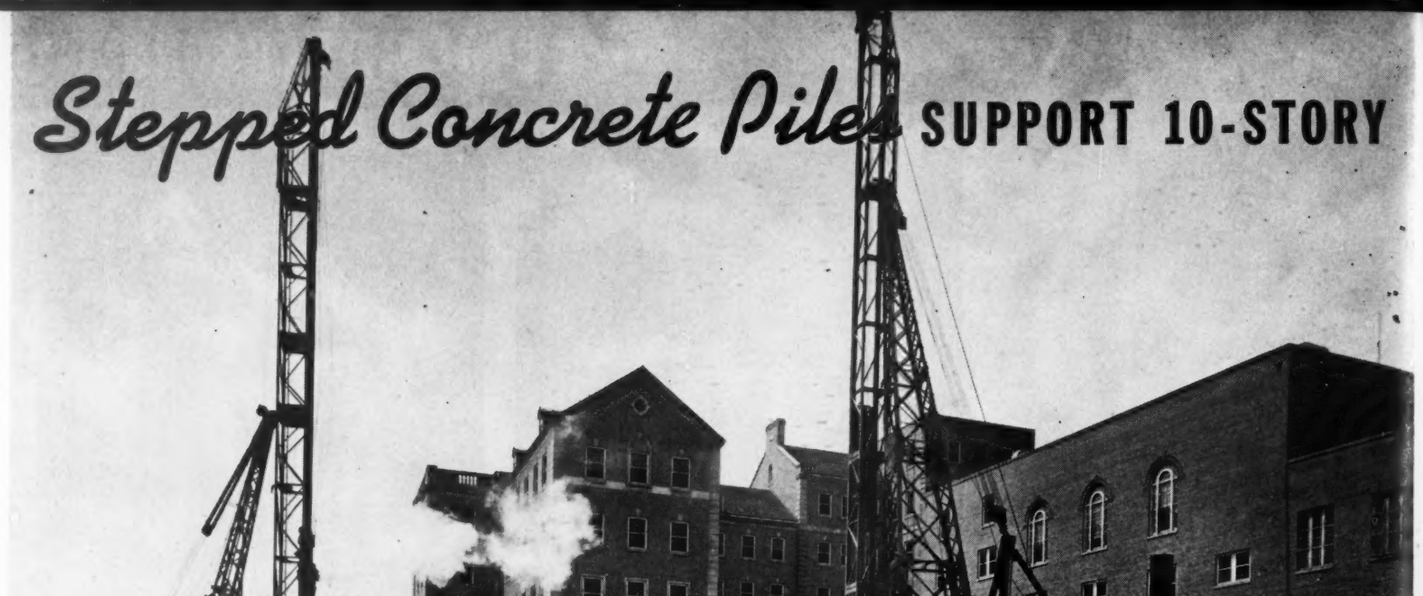
NEW PRESIDENT of New York Building Congress is **M. H. FOLEY**, of Voorhees, Walker, Foley & Smith, architects. He succeeds J. Andre Fouilhoux who was killed in accidental fall. Mr. Foley headed Building Congress from 1940 to 1942 but was out of country for most of term, as he was managing partner in Trinidad for Caribbean Architect-Engineer in design of Army air bases.

STRUCTURES AND ROADWAY for 15-mi. single-track connection between two sections of Canadian National Railway around northern side of Montreal have been completed by C. A. Pitts, General Contractor, Ltd., of Toronto. Pictured are **C. A. PITTS** (left), president, and **N. S. BATEMAN**, construction engineer.

ELECTED PRESIDENT of Houston, Tex., chapter of Associated General Contractors of America is **OTIS VAN DE MARK**, vice president, American Construction Co.

THREE ASSISTANT CHIEF ENGINEERS have been named to aid Chief Engineer **WALKER R. YOUNG** (left) in Denver office of U. S. Bureau of Reclamation. They are (left to right): **RALPH LOWRY**, construction; **LESLIE N. McCLELLAN**, electrical and mechanical; and **WILLIAM H. NALDER**, civil. Mr. Lowry was formerly construction engineer at Shasta Dam. Mr. McClellan was chief electrical engineer of Bureau, while Mr. Nalder has acted as chief designing engineer.

Stepped Concrete Piles SUPPORT 10-STORY



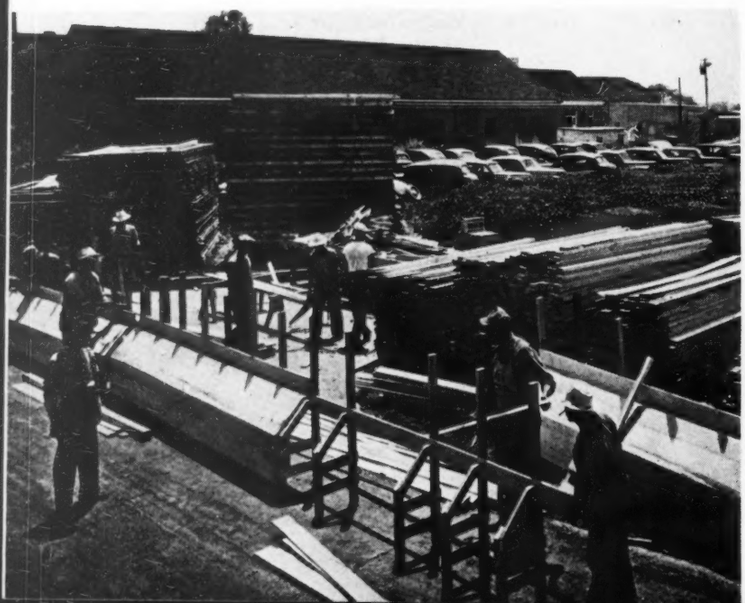
10.75-IN. O.D. PIPE (left foreground) forms lower part of concrete piles. Upper part consists of mandrel-driven, step-taper shells. Crawler rig with 5,000-lb. ram, at left, and Raymond full-revolving driver with 6,500-lb. ram, at right, are two of three rigs used in placing 1,612 concrete piles.

RECENTLY APPOINTED chief of the Building Materials and Housing Branch of the Economics Division of the U. S. Group Control Council for Germany, Clifford S. Strike, while retaining civilian status, will be accredited to the staff of Lt. General Lucius D. Clay, deputy military governor under General Dwight D. Eisenhower.

ADDITION OF TWO TEN-STORY WINGS to the Dearborn, Mich., Veterans' Hospital involved the relocation of all underground utilities for the existing five-story structure and the driving of concrete foundation piles to depths of 73 to 80 ft. Relocation of utilities—gas, water and electricity—was accomplished without interrupting normal hospital requirements. A 4,800-v. power line was carried over head until new permanent ducts were built.

Three piledriving rigs were used in placing a total of 1,612 concrete piles. The rigs consisted of two crawlers with 5,000-lb. rams, and a Raymond full-revolving driver with a 6,500-lb. ram, mounted on skids and rollers. To meet

FORMS FOR REINFORCED CONCRETE (below), requiring 450,000 b. ft. of lumber are constructed at central point and delivered to job ready for use.



FIELD STAFF (below) for F. H. McGraw & Co. on Dearborn job are: (Left to right) U. D. GOSSELIN, general superintendent; JACK ILGEN, job engineer; P. T. O'BRIEN, accountant; HOWARD ALLGOOD, general labor foreman; RAYMOND NUNEZ, expediter; and KARL BRACHER, office engineer.

WINGS OF VETERANS' HOSPITAL

By CLIFFORD S. STRIKE
President, F. H. McGraw & Co.

specifications, the piles were driven to depths of from 73 to 80 ft., to refusal on the basis of 16 blows to the last inch with a 5,000-lb. ram or 12 blows with a 6,500-lb. ram.

Steel-Frame Structures—At the time these notes were written construction of the superstructure had not begun. The new wings will be 144x202-ft. tee-shaped, steel-frame structures, with concrete floors. They will be faced with ashlar limestone to the third floor and with smooth-face brick above that level. The two new units are structurally independent but connect with the old hospital by means of corridors.

$3,000,000 Project—F. H. McGraw & Co., engineers and constructors, is handling the $3,000,000 project which will provide not only the most modern improvements in medical and surgical science but also the best physical comforts for patients that American engineering and construction experience can devise. The company's general superintendent on the Dearborn project is U. D. Gosselin. He was engineer in charge of the

(Continued on page 172)

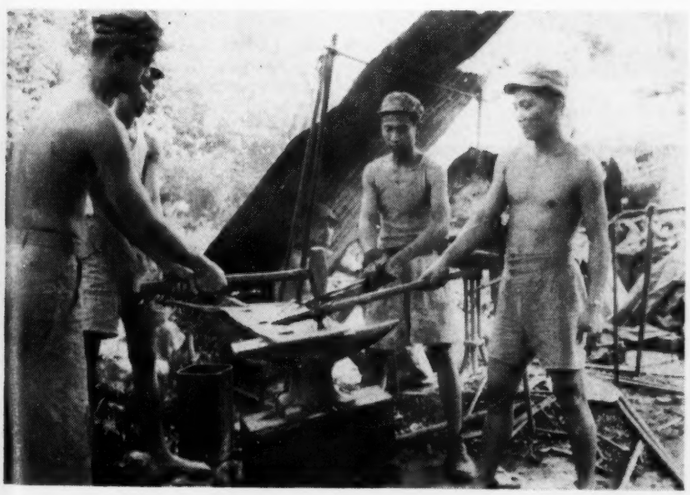
STEP-TAPERED CONCRETE PILES with steel pipe bottom sections are placed by crawler rig with 5,000-lb. ram, at left, and Raymond full-revolving driver with 6,500-lb. ram, at right.

Philippine Army Engineers BUILD BRIDGE ON LUZON

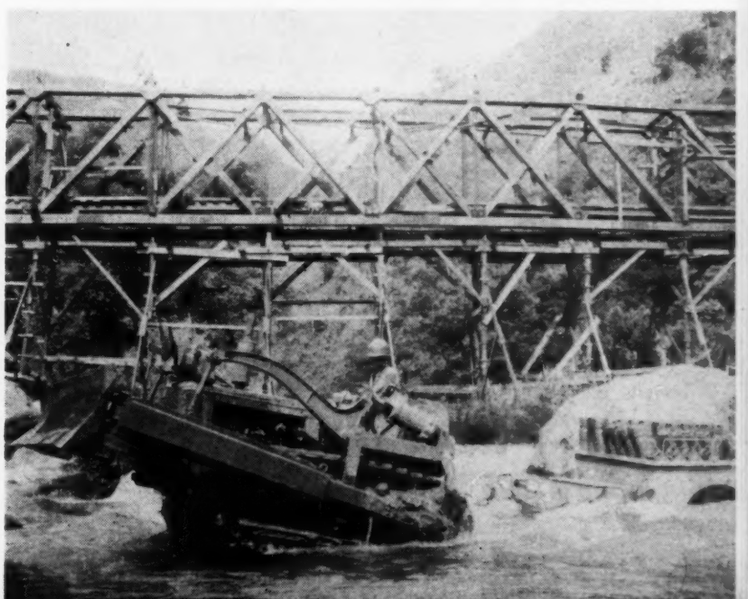
A TIMBER BRIDGE across the Butac River in the Philippines was constructed by members of the Philippine Army Engineers. All bolts, tension rods, fish plates and tierods were formed entirely by hand. Lumber was supplied by the U. S. 6th Army. The new bridge is northeast of Suyo, Ilocos Sur, on Luzon.

Signal Corps Photos

PHILIPPINE ARMY ENGINEERS make fish plates by hand for construction of timber bridge.

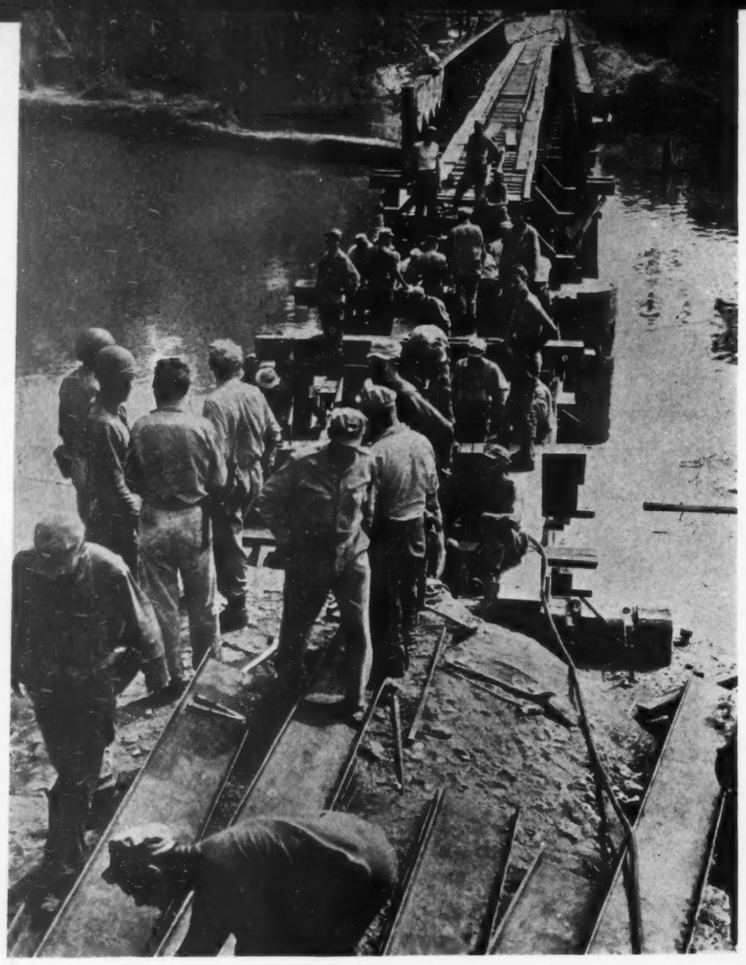


TRACTOR-BULLDOZER hauls ammunition to support Philippine Army through treacherous Butac River before completion of bridge in background.



Army Engineers *Rebuild* *Philippine Railroads*

Signal Corps Photos



RAILROAD BRIDGE on Luzon Island in Philippines is reconstructed by U. S. Army Engineers. This structure, which crosses Mayruso River at Calsiano, was blown up by U.S. troops in 1942 before fall of Philippines, rebuilt by Japanese, then demolished by Japs when MacArthur's troops landed.

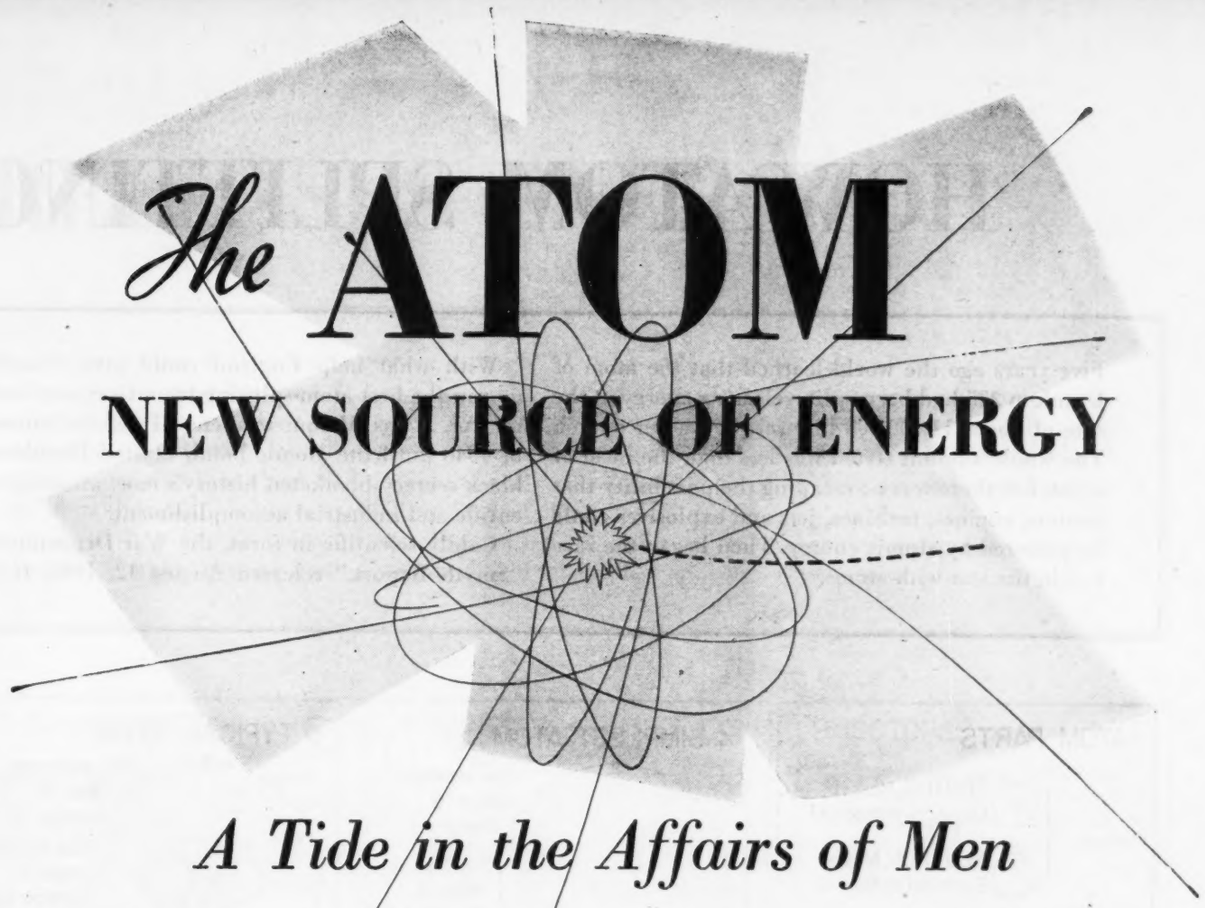
MANILA RAILROAD LOCOMOTIVE, captured intact from Japs, is guarded by American soldiers and operated by Filipino engineer who was employed by railroad before fall of Philippines.

←

FILIPINO TRACKMEN lay ties and spike rails in place for reconstructed railroad track at San Fabian station on Luzon.

JEEP TRAIN (below) hauls three freight cars loaded with gasoline out of San Carlos, Luzon, to front over rebuilt Manila railroad, thus freeing six 2½-ton trucks for other work.

The ATOM
NEW SOURCE OF ENERGY



A Tide in the Affairs of Men

On August 6, 1945, an atomic bomb exploded over the Japanese city, Hiroshima.

Its concussion blasted the city, vaporized the fibre of Japan's will to resist, and flashed across the world a light of such glaring intensity that even blind eyes could glimpse the forked road that is presented to humanity's choice and destiny.

It has been a scant fifty years since Pierre and Marie Curie embarked upon their research with the avowed intent of discovering "how the atoms of the universe are put together". Their work contributed radium to the knowledge and use of mankind, but it marked only a way station upon the awesome quest which they announced and which thousands of scientists have since pursued.

Under the compelling stimulus of war, the first major application of the release of atomic force has been in an instrument that raises by an unimaginable dimension our ability to dole out death. We can be devoutly grateful that the scientific leadership of the Allies, and particularly the industrial strength of the United States, brought to us, rather than to our enemies, priority in the development of this dread weapon. But even in its present infant phase, it is clear that ownership of the principle of the atomic bomb carries a trusteeship of terrifying gravity.

We hold in trust a power that is capable of unraveling the very fabric of our civilization. Equally, it may be susceptible of development as a mighty force for human welfare. But we have proved the destructive use, while the constructive applications are still in the realm of speculation.

Clearly the trust is of a magnitude that transcends national jurisdiction. No walls have ever been built high enough to fence in the spread of scientific knowledge, and even if we were resolved to forego the harnessing of atomic power for peace, it is hopeless to think that its application for war can be held for long as the monopoly of one, or a small group of nations.

At one giant stride our scientific and technological development has so far outdistanced our social engineering, that we have no choice but to turn our full powers of creative imagination to control the forces we have unleashed and to bend them to man's use rather than to his destruction.

Since control is not possible without understanding, I have asked several of my editorial colleagues in the McGraw-Hill organization to present on the pages which follow a non-technical but authoritative account of the known facts and implications of atomic power.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Co., Inc.

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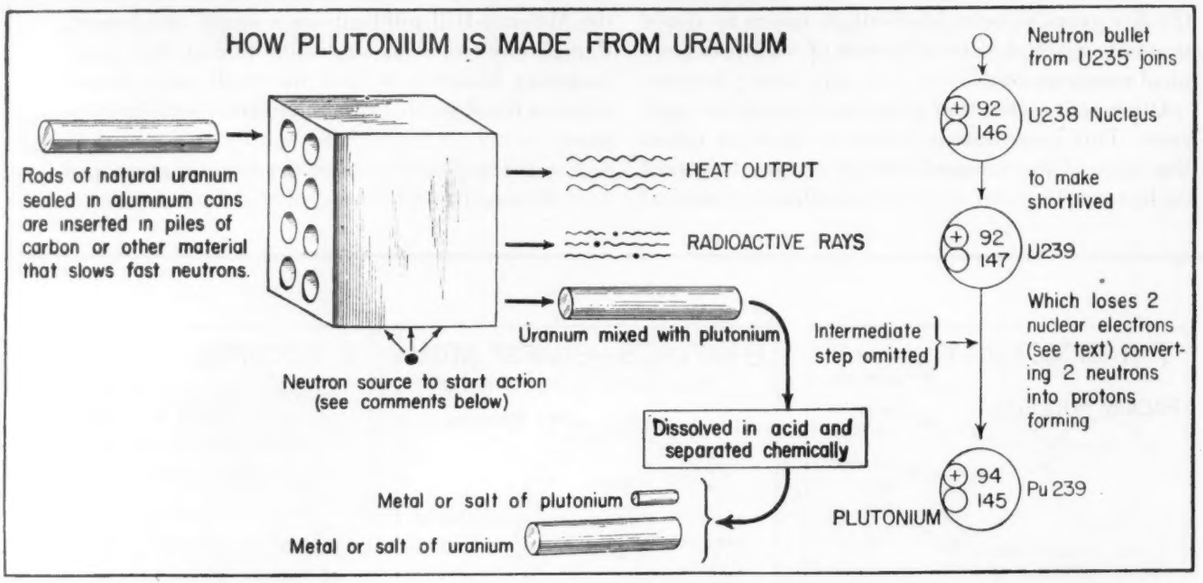
CREATING and ISOLATING

Man-Made Plutonium—U-235 Substitute


HOW PLUTONIUM IS MADE FROM URANIUM
Rods of natural uranium sealed in aluminum cans are inserted in piles of carbon or other material that slows fast neutrons.
HEAT OUTPUT
RADIOACTIVE RAYS
Uranium mixed with plutonium
Neutron source to start action (see comments below)
Dissolved in acid and separated chemically
Metal or salt of plutonium
Metal or salt of uranium
Neutron bullet from U235 joins
92 146 U238 Nucleus
to make shortlived
92 147 U239
Intermediate step omitted
Which loses 2 nuclear electrons (see text) converting 2 neutrons into protons forming
94 145 Pu 239
PLUTONIUM

We now have two kinds of atoms suitable for energy supply, Uranium 235 and the new man-made element No. 94, plutonium. Uranium, No. 92, has the heaviest atom of any natural element.

The Manhattan Project's plant, on the Columbia River at Hanford, Washington, is the world's greatest atom-making factory. Devoted entirely to the mass production of plutonium atoms, it uses U-238 as the raw material and U-235 as the energy source, intimately mixed in the same proportions as in natural uranium metal.

The production units at Hanford are several huge uranium "piles." Each is a very large block of graphite with holes in which are placed uranium-metal cylinders, sealed in aluminum cans to protect the uranium from corrosion by the cooling water constantly pumped through the pile.

Each pile runs itself, so to speak. Not even the conventionally pictured bits of radium, beryllium and paraffin are needed as a "pilot light" to start operation. There are always enough stray neutrons, or even cosmic rays, to start a chain reaction.

But once started, the design, size and control of the unit must be such that the chain reaction will continue at an even rate — neither die down nor overshoot into an explosion.

To see this picture in atomic terms, consider the fraction of a second in which one million U-235 nuclei are split, producing two million lighter atoms (say, one million of barium and one million of krypton) and between one and three million fast-moving neutron projectiles.

Some of these escape in free flight right through the relatively vast atomic "open spaces." Some are "captured" by the many U-238 nuclei, and others are captured by the impurities. But, on the average, of the one to three million, just one million neutrons must succeed in smashing another million U-235 atoms in the next fraction of a second. Thus, with reproduction rate exactly maintained, life goes on in the atomic-energy pile.

The carbon, one of several possible "moderators," serves to slow down the neutrons without capturing many. The chance of a fast, straight-moving neutron hitting a tiny nucleus is very small, whereas the "slow ball" neutron is likely to be sucked in by the nuclear attraction if it would otherwise be a near miss.

From the practical angle, maintaining a chain reaction requires careful design and good controls. The pile must be slightly larger than actually necessary for a chain reaction (that means scores of tons of material). Controls must be sensitive and dependable. They slow the pile down to the balancing point by sliding in retarders, such as strips of cadmium.

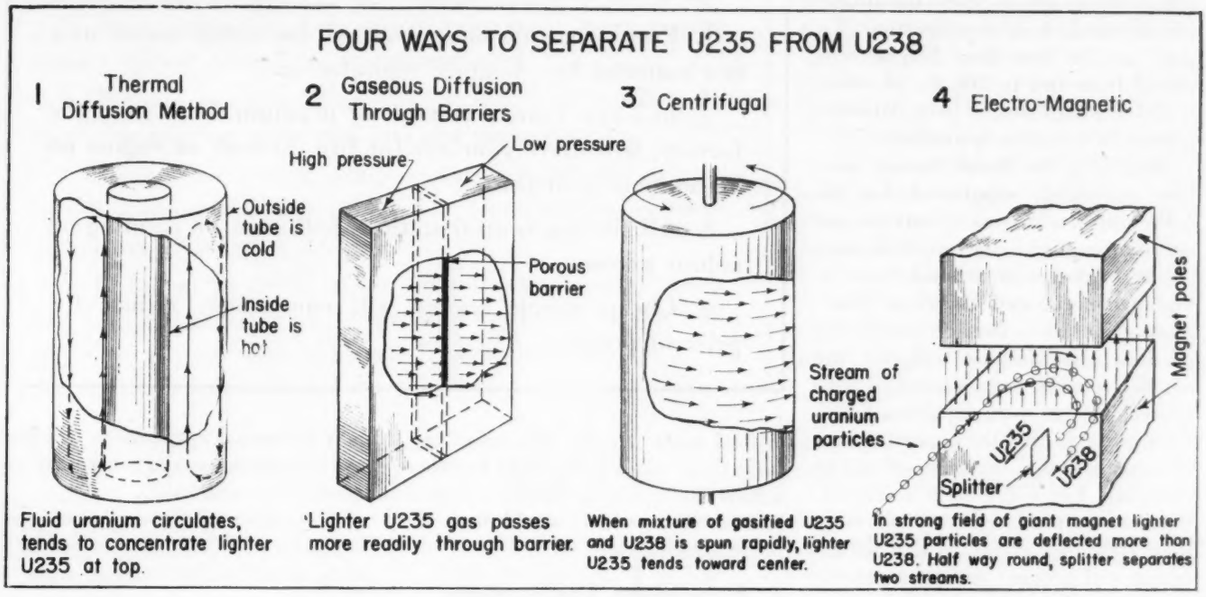
As already noted elsewhere, the energy released is about 11,400,000 kilowatt-hours for each pound of U-235 split. This energy appears first in the high speed of the pieces thrown off by the atomic split, then is converted to sensible heat as collisions slow down these projectiles. The energy is finally removed from the pile in the form of hot air, steam, hot water or other heated fluid in commercial quantity and thermal condition.

Such piles, operated with normal uranium, or with uranium enriched in U-235, would seem to be the primary means by which atomic energy will serve (if ever) as a commercial source of heat and power. Plutonium would be a byproduct, but might under certain conditions add to the energy yield of the pile without the need to separate it from the uranium.

The use of normal uranium in the Hanford pile sounds extremely attractive as a heat source, but has certain economic disabilities. Only a small part of the U-235 is used up before the pile must be shut down to remove the plutonium.

THE HIGH-POWER ATOMS

Isolating U-235 — a Gigantic Task


FOUR WAYS TO SEPARATE U235 FROM U238
1 Thermal Diffusion Method
2 Gaseous Diffusion Through Barriers
3 Centrifugal
4 Electro-Magnetic
Outside tube is cold
Inside tube is hot
High pressure
Low pressure
Porous barrier
Stream of charged uranium particles
Magnet poles
U235
U238
Splitter
Fluid uranium circulates, tends to concentrate lighter U235 at top.
Lighter U235 gas passes more readily through barrier.
When mixture of gasified U235 and U238 is spun rapidly, lighter U235 tends toward center.
In strong field of giant magnet lighter U235 particles are deflected more than U238. Half way round, splitter separates two streams.

Many of the uranium ores, including most samples of pitchblende and carnotite, will yield from 1 to 15% metallic uranium. Chemical separation of the metallic "natural" uranium is simple. Whatever the source, natural uranium contains the three isotopes in the constant proportions of 99.3% U-238 and 0.7% U-235, with traces of U-234.

Separating the U-235 from U-238, an operation essential for explosive uses of U-235, and probably important for future commercial controlled-chain piles, has been most difficult. Chemical separation was impossible because U-235 and U-238 are chemically the same.

The only possibility was a separation by physical differences, primarily a one percent difference in weight. The porous barrier and centrifugal methods pictured above required vaporizing a salt of uranium. All the methods shown have been used or tried on the Manhattan Project. All require many stages to achieve a substantial concentration of Uranium 235.

Dollarwise Thoughts on Atomic Energy

Costs mean little in war, but peacetime uses of U-235 and plutonium must pass the dollar test in competition with coal, fuel oil, natural gas, gasoline and electricity.

On the basis of energy costs only, "*all other things being equal,*" the table on the last page of this section shows at what price per pound U-235 would give the same energy cost as conventional energy sources selling at the indicated prices. For such comparisons it is convenient to remember that one pound of U-235 is equal (energy-wise) to about 11,400,000 kilowatt-hours, also to 1500 tons of coal, or 200,000 gallons of gasoline.

Fuel engineers understand the limitations of such oversimplified comparisons. Others should be warned that "all other things" are never equal. With this thought in mind, reconsider the uranium piles operated at Hanford to produce plutonium. These use U-235 in the cheapest form, say about $1400 per lb., assuming purified normal uranium at $10 per lb. (140 lb. of uranium contains one pound of U-235.)

If this were the whole story, coal would have to sell for a dollar a ton to break even with U-235 as a water heater. However, the pile using normal uranium must be immense to hold its own in a chain reaction. More important, the accumulating fission products "poison" the reaction after only a small part of the U-235 has been used up. Then the uranium cylinders must be removed for plutonium recovery. Finally, it has not yet been found possible to operate the normal-uranium piles at high enough temperatures for practical power production.

If we go to the other extreme and build a small pile, using concentrated U-235, we shall run into excessive material costs, perhaps several times the $52,000 per lb. set down in the table as the equivalent of 20-cent gasoline.

Something between the two extremes is likely to prove the most economical — perhaps a pile operating on a U-235 concentration between 1 and 10%.

The engineer of the "atomic-power age" must know the price of Uranium 235 *in various concentrations* and the characteristics of piles suited to them. No such information is yet available. He must also watch the danger from radio-activity; the requirements for radiation shields; explosion hazards, etc.

CONTINUED ON NEXT PAGE

WHAT TO EXPECT

Before discussion of possible and probable future applications of atomic energy to the arts of peace, the atomic bombs should have consideration. We may assume that these bombs contained from two to 200 lb. of either U-235 or plutonium, or both. No more precise information is available.

Details of the bomb design have been completely suppressed, but the following basic considerations are stated or implied in the Smyth Report:

The explosive in a bomb must be highly concentrated U-235 or plutonium. Since slow neutrons could not produce a satisfactory explosion, the neutron retarder or *moderator*, is minimized. This, in turn, requires a U-235 mass so large that the escape of neutrons without hitting nuclei will not be excessive. For every 1000 atoms hit, the neutrons produced must split more than 1000 new atoms, so that the reaction will proceed rapidly in an expanding chain, as sketched below.

There can be little leeway in the size of the explosive charge. For a given shape there is a certain "critical" weight of material. If this is exceeded the bomb explodes instantly. If the weight of charge is less than the critical, it cannot be made to explode.

Therefore, the critical mass must be created at the moment of explosion.

The Smyth Report suggests that this can be accomplished by breaking down the charge into two or more well-separated parts, each having less than the critical mass. At the appointed moment these could be brought together within the bomb to create a supercritical mass, which would then explode automatically.

CLAIMS LIKE THESE ARE NOT JUSTIFIED

1. Pretty soon no more coal will be mined except as a raw material for chemical manufacture.

2. In a few years a tiny bit of uranium, built in at the factory, will drive your car for life through an engine no bigger than your fist.

3. All the big central stations will soon be running on atomic power.

4. Cheap atomic energy will enormously reduce the price of power.

Peacetime Applications

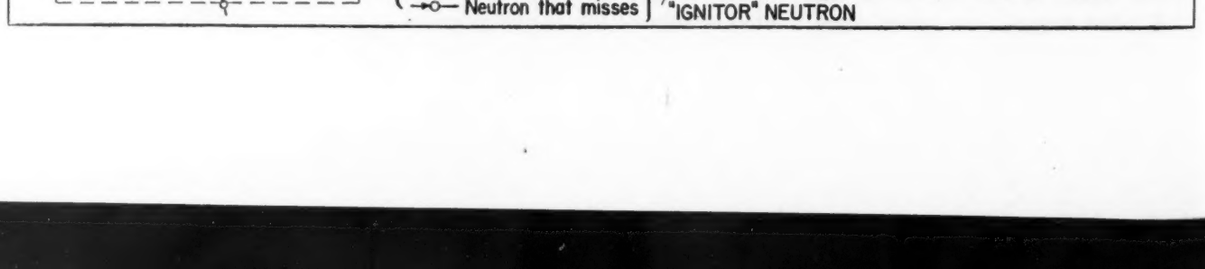
Except possibly for superblasting operations, uncontrolled explosive reactions cannot be permitted in the peacetime use of atomic energy. This means that the quantity of U-235 assembled in any one spot must always be kept well below the critical weight to avoid spontaneous explosion.

Depending on the particular application, the most desirable concentration of U-235 may range anywhere from the 0.7% in normal uranium up to 100%, with the probability that many industrial applications will find the greatest economy in concentrations between 1% and 15%.

This matter of the degree of concentration of U-235 has received little public attention, yet nothing could be of greater practical importance. To make this point clear, consider the two extremes, 0.7% of U-235 and 100% of U-235, respectively.

The Hanford pile, using normal uranium (0.7% U-235) with carbon moderator, must be very large to work at all. It is inefficient in the sense that it must be shut down after a small part of the U-235 has been consumed. It cannot operate at high temperatures.

Its great advantage as a heat producer is the fact that its U-235 is bought at the lowest possible price. If


PRINCIPLE OF ATOMIC EXPLOSION
U235
U235
Pieces well separated to prevent neutrons of one piece bombarding the other
Less than critical mass
Less than critical mass
Bringing pieces together rapidly creates more than critical mass starting explosive chain reaction.
STRAY NEUTRON
EXPLOSIVE CHAIN
PILE "BURNS" U235 TO GENERATE HEAT AND PLUTONIUM
CARBON
SHIELD
URANIUM IN CANS
Carbon slows down neutrons for easier hits on U235 nuclei. Hits on U238 start plutonium creation.
COLD WATER
HOT WATER
Piles using natural uranium will not operate unless many tons of material are used to reduce neutron escape.
NEUTRON MODERATOR
Not essential
BERYLLIUM
RADIUM
A
B
Enriching uranium (more U235) makes smaller piles possible.
C
D
Balanced chain will average one successful neutron for each atom split
U235 Nucleus
Same exploding
Neutron that hits
Neutron that misses
"IGNITOR" NEUTRON

FROM ATOMIC ENERGY

. . . BUT REMEMBER THESE FACTS

1. The large-scale, controlled release of heat energy from U-235 has been fully demonstrated.

2. Beyond question, this energy could be applied directly for heating water and air, and making steam.

3. Such heat, in turn, could be applied directly, or converted into mechanical power or electricity by conventional steam turbines and gas turbines.

4. If and when U-235 in concentrations up to 10% costs less than $25,000 per lb., it may find applications, but will compete, at first, with premium fuels rather than coal.

purified normal uranium sells for, say, $10.00 per lb., the price of 140 lb. (containing one lb. of U-235) will be only $1400. This would be a very favorable price if the pile could operate efficiently with the 0.7% U-235.

Concentrating the U-235 to 100% would permit a much more compact and convenient pile – perhaps little more than small pieces of U-235, encased in aluminum to ward off corrosion, and immersed in a tank of water: this should convert the water into steam at a regulated rate.

In large part, the control would be inherent. The water as a moderator would keep the chain going, but if the reaction got too violent, the resulting higher superheating of the steam would decrease the moderator effect and thereby hold the reaction in check. Yet even if all this comes true the cost of concentrated U-235 in the near future will be many times $10,000 per lb.

Running up the concentration only a few percent above that in normal uranium may prove to be the way to get reasonable pile size and good efficiency without incurring exorbitant concentration costs.

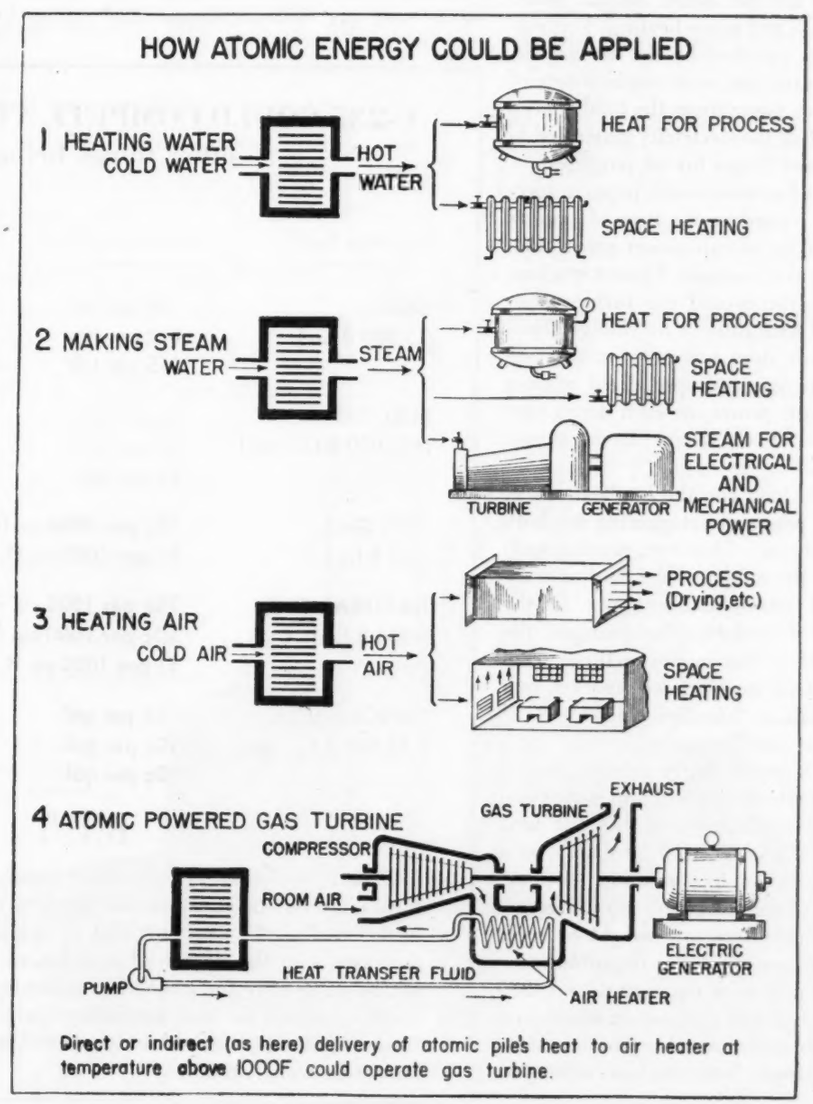
When atomic energy is applied, the starting point is heat, picked up by water, air or a special heat-transfer fluid. Intermediate heat transfer fluids may be essential in certain applications (space heating and service water, for example) where people must be protected from injury by radioactivity.

The intermediate heat-transfer fluid shown for the gas turbine would, of course, have to operate at temperatures up to 1200 F. There seems to be no basic reason why the pile itself could not be built inside the compressed-air receiver, discharging its heat directly to the compressed air.

With rather high concentration of U-235, this arrangement might be suitable for large airplane drive if excessive weight of radiation shields could be avoided.

Also, presumably, rockets and planes of the "buzzbomb" type could be powered by atomic heat delivered to the air of the jet steadily, not in puffs.

The sketches stress direct applica-



Direct or indirect (as here) delivery of atomic pile's heat to air heater at temperature above 1000F could operate gas turbine.

THESE THINGS MIGHT RESTRICT USE OF ATOMIC ENERGY

1. Ineffectiveness of large piles using normal U-235 concentration
2. High cost of concentrated U-235 for smaller, more effective piles
3. Danger from radioactivity
4. Weight and cost of shielding against radiation
5. Explosion hazard
6. Possible short supply of uranium
7. Governmental restrictions on atomic-energy materials

tions of hot air, steam and hot water to process and space heating. This emphasis is justified by the often overlooked fact that such applications of heat have many times the total energy value of all the electricity generated in the United States for all purposes.

There has been much popular speculation regarding the type of engines required for atomic-power generation. The answer is simple. Present engines, steam turbines and gas turbines can be used with little or no change. This, of course, does not rule out the possible discovery of specialized engines for atomic power, or even direct production of electricity from atomic energy.

In the long run the implications of atomic power are staggering for both war and peace. However, popular writers on the subject have undoubtedly created unreasonable hopes in the minds of readers — for example, the expectation that in two or three years the Detroit builders will market cars with built-in "lifetime" slugs of U-235 and "fist-sized" engines.

Yet it seems fairly safe to predict that atomic energy will find some commercial applications within the next five or ten years, first, probably, as a premium fuel like aviation gasoline, worth a fancy price for specialized applications where low weight or some other characteristic is important.

As the cost of concentrating U-235 is reduced and application efficiencies improved, atomic energy may compete with cheaper fuels, perhaps ultimately with coal.

Important non-power applications of atomic energy may well include the ultra-high-temperature processing and fabricating of materials—also, modern "alchemy": building and rebuilding atoms to create new elements and to produce old elements at lower costs.

Radioactivity obtained directly or indirectly from artificial atom-splitting should find many important medical and industrial applications.

Turning back to ordinary power applications, we must avoid the temptation to overstress the economic importance of lower-cost power fuel. Fuel cost is only about 17% of the gross receipts of the electric utilities. Here's another way to put it: If, after allowing for transmission losses, one kilowatt-hour delivered to the consumer from modern plants represents a coal consumption of 1.5 lb., and if the coal costs $5.00 per ton cancellation of the coal bill could not save more than 3/8 of a cent per killowatt-hour. And atomic fuel will certainly not be free.

Performance of the atomic bomb is a monument to the scientists who unlocked the secrets of the atom and suggested the basic technique of making plutonium and concentrating U-235.

From there on, the job was at least 50% engineering. The various big plants of the Manhattan Project are vast assemblages of pipes, tanks, boilers, valves, instruments and controls, installed and operated by engineers, largely designed by engineers. From now on, the speed with which atomic power becomes practical will depend on the effectiveness of the engineer-scientist team.

It is possible, of course, that national controls may completely upset the entire technical and economic pattern of this discussion. For reasons of national security the government may decide to control or restrict atomic-power materials, plants and operations in ways not yet determined.

U-235 COULD COMPETE AT THESE PRICES

other things being equal

Common fuel	*Assumed prices*	*Comparable prices for Uranium 235, dollars per pound (nearest thousand)*
COAL	$6 per ton	$9,000
(13,000 B.t.u.)	$12 per ton	$18,000
	$15 per ton	$23,000
FUEL OIL	2¢ per gal.	$5,000
(150,000 B.t.u. gal.)	4¢ per gal.	$10,000
	8¢ per gal.	$20,000
CITY GAS	50¢ per 1000 cu. ft.	$39,000
(500 B.t.u.)	$1 per 1000 cu. ft.	$78,000
NATURAL GAS	25¢ per 1000 cu. ft.	$10,000
(1000 B.t.u.)	50¢ per 1000 cu. ft.	$20,000
	$1 per 1000 cu. ft.	$40,000
GASOLINE	10¢ per gal.	$26,000
(150,000 B.t.u. gal.)	20¢ per gal.	$52,000
	30¢ per gal.	$78,000

BUT

Note that "other things" are never equal. U-235 in normal uranium form is by far the cheapest, but involves use of excessively large and inefficient "piles." The unit cost of the U-235 in enriched mixtures increases with the degree of enrichment. Over-all cost comparisons can be made only for a specified concentration of U-235 and for apparatus suitable for that particular concentration. Possible explosion danger and need to protect personnel against radiation are other important considerations.

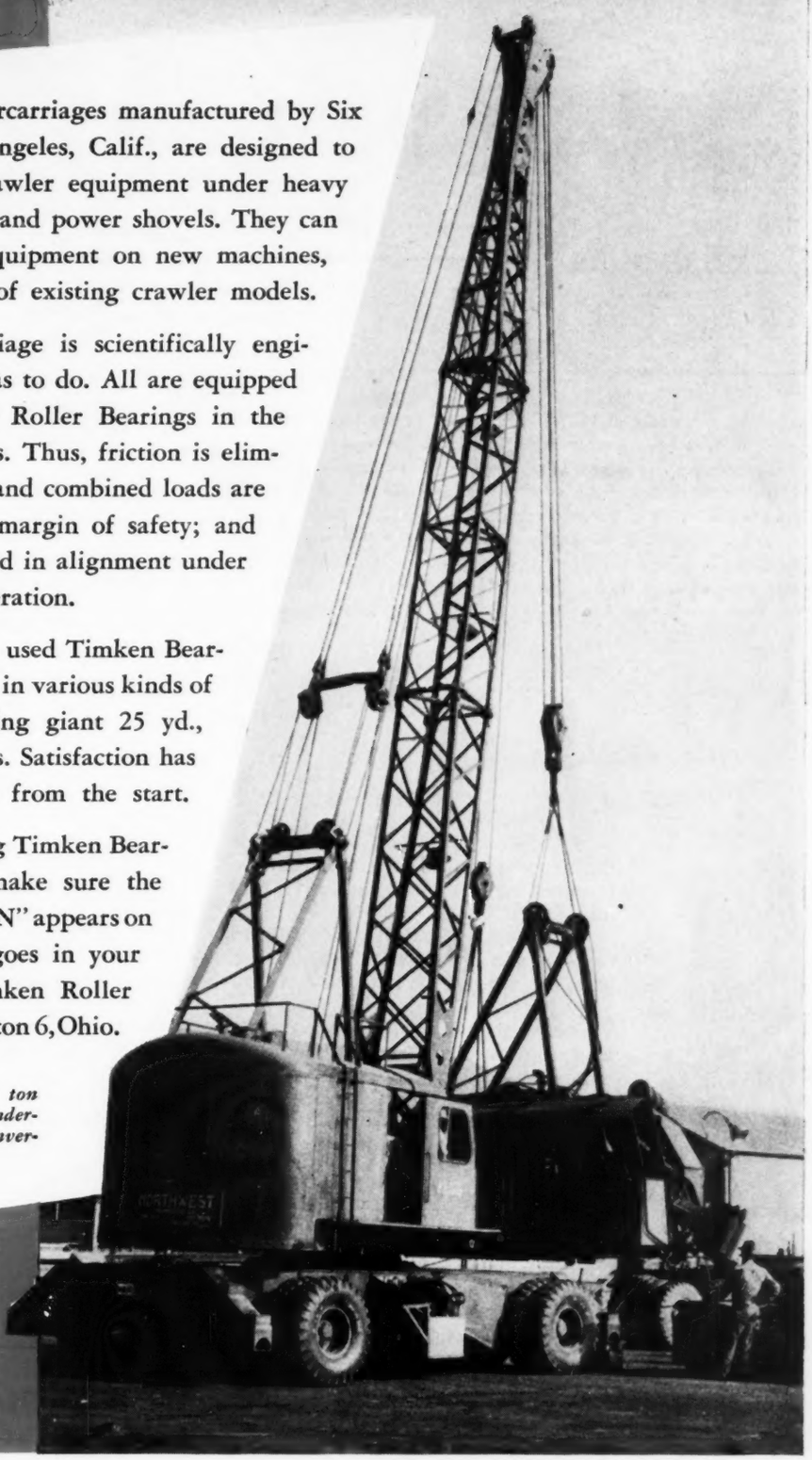
They move faster on Maxi Undercarriages
EQUIPPED WITH TIMKEN BEARINGS

Maxi Undercarriages manufactured by Six Wheels Inc., Los Angeles, Calif., are designed to take the place of crawler equipment under heavy duty cranes, draglines and power shovels. They can be used as original equipment on new machines, or for the conversion of existing crawler models.

Every Maxi Undercarriage is scientifically engineered for the job it has to do. All are equipped with Timken Tapered Roller Bearings in the drives and on all axles. Thus, friction is eliminated; radial, thrust and combined loads are carried with a wide margin of safety; and moving parts are held in alignment under all conditions of operation.

Six Wheels Inc. has used Timken Bearings for many years in various kinds of equipment, including giant 25 yd., 50 ton dump trucks. Satisfaction has followed their use from the start.

To be sure of getting Timken Bearing performance, make sure the trade-mark "TIMKEN" appears on every bearing that goes in your equipment. The Timken Roller Bearing Company, Canton 6, Ohio.



Northwest Model 71, 35-40 ton crane mounted on Maxi Undercarriage assisting in the conversion of another crane.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

LEGAL ADVENTURES of TRACTOR CONN

By LESLIE JOBB

No contractor ever tries to be his own dentist or his own shoemaker. It is even more dangerous for him to be his own lawyer. There are, however, some legal rules which every contractor should know, and these rules may be explained in plain English without resorting to the jargon of the law, unintelligible to most laymen.

This series of articles, dealing with the Legal Adventures of Tractor Conn, a typical contractor anywhere in the United States, explains some of these legal points in plain language for the contractor. Each one is based on an actual decision of an American Court.

The Case of the Implied Authority

When Tractor Conn orders his foreman to employ John Smith, and the foreman does so, Conn is liable for Smith's wages, on the ground that the foreman had "express authority" to hire Smith.

On the other hand, if Tractor Conn merely tells his foreman to go ahead and do a certain job and the foreman hires the necessary employees to do the work, then Conn is liable for their wages on the ground that the foreman had "implied authority."

Now, suppose that the foreman is in charge of certain work, one of the employees is seriously injured in the course of his work, and the foreman hastily summons the nearest physician to attend the injured man.

Then the physician sends his bill to Tractor Conn and Conn refuses to pay.

"I have no contract with you. I didn't even know that you were practising medicine in this city until I got your bill," Conn declares.

"I was employed by your foreman to treat one of your employees and the foreman had implied authority to engage me," is the doctor's argument.

This point came before the North Carolina Supreme Court in the case of Miller vs Cornell, 122 Southeastern Reporter, 385 and the Court ruled in the doctor's favor.

"If the foreman was superintendent of the construction and had entire charge, had authority to buy materials and repair and mend the broken machinery, did he not have implied authority to authorize the doctor to care for and administer to the broken and injured employee under the facts and circumstances of this case?" said the Court.

The Case of the Unsigned Contract

Tractor Conn agreed to erect a certain building and the building contract was written out in full, except that the time and manner of payment were left blank. Conn began work on Jan. 2, on Jan. 10 the contract blanks were filled in, and the contract was signed.

"Now, I'll take my pay for the work I've done to date," Tractor Conn demanded.

"According to the contract you've just signed, you're to be paid every two months," the owner pointed out.

"Yes, but that contract wasn't signed and was partly blank when I did this work and applies only to work done after it's signed," Conn retorted.

"The work already done must be considered as done under the contract, and the time of payment is governed thereby," said the New York Court in ruling against Conn, in Reynolds vs Welsh, 8 N.Y. St. 404.

The Case of the Undelivered Notice

"The said building shall be completed according to this contract and these plans and specifications, on or before the first day of April next, and the contractor shall pay the sum of $50 by way of liquidated damages and not by way of penalty for each day's default after said date," a building contract specified. Tractor Conn gave a bond, signed by Johnson as surety, for the prompt completion of the work.

"Notice of default to the said surety shall be a condition precedent to any right of action against the said Johnson," the bond stated.

The building was not completed by April 1, but the owner gave Johnson no notice. Tractor Conn continued the work for a time, then abandoned it, and the owner promptly notified Johnson of the failure to complete the contract.

"By failing to notify me that the building was not completed on time, you relieved me from any liability under my bond," Johnson contended.

"I might have relieved you from the $50 per day penalty, but I did not relieve you on the failure to complete the contract at all, as I notified you promptly on that," the owner retorted. The U. S. County Court of Appeals ruled in the owner's favor in the case of Community Building Co. vs Maryland, 8 Fed.(2) 678.

More Legal Adventures of Tractor Conn Next Month

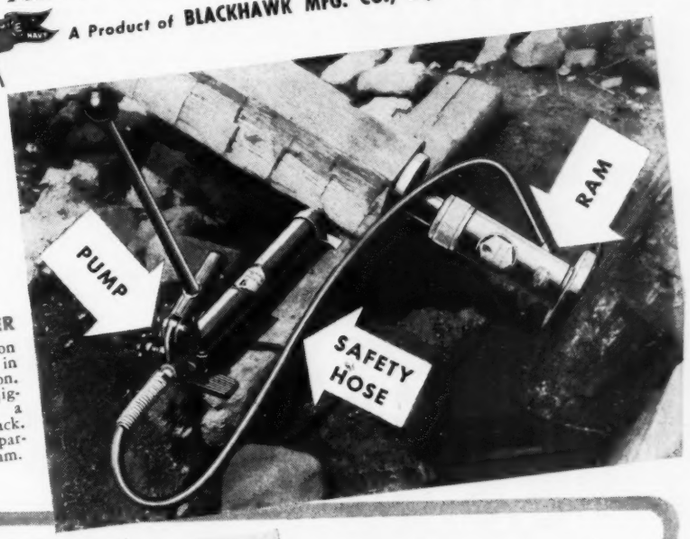
Porto-Power ... Harnessed Hydraulic Power FOR 1001 TOUGH JOBS!

TOUGH jobs soften up quick—when Blackhawk Porto-Power gets at them with its tons of hydraulic power. Easily transportable by one man and operated by him with hair-trigger accuracy. It goes right to the job, and right to work. This "educated" hydraulic jack builds up into many combinations to push, pull, lift, clamp, spread, bend, and press—in any direction. Porto-Power Hydraulic Units are made today in 7, 10, 20, and 50-ton capacities. See your distributor about Blackhawk Porto-Power, Hydraulic Jacks and Wrenches.

A Product of **BLACKHAWK MFG. CO.**, Dept. P1695, Milwaukee 1, Wis.

PORTO-POWER will "go to any length" to get the job done! Ordinary Jacks have fixed heights and, for some jobs, must be built up with dangerous blocking that may buckle under pressure. But Porto-Power's steel extensions build up rigidly and quickly for any span, as shown above.

PORTO-POWER gives a precision push to a timber in a shoring operation. No dangerous jiggling as with a mechanical jack. The pump is separate from the ram.



PORTO-POWER takes a toe-hold, too! Equipped with a base-plate and toe, Porto-Power lifts and lowers machinery and heavy objects. Here, an S-78 lifts from a low of 3½" to an 8½" height—so rollers can be shoved under this steam winch. Safer, faster than mechanical jacks and crowbars.

BLACKHAWK

PONY

Solid Shank FEATHERWEIGHT Shovels

PERFECT BALANCE

A new redesigned socket gives to the PONY Solid Shank Shovel the perfect balance which no other solid shank shovel has.

Equipped with SHOCK BAND

The famous ABW Shock Band gives to the shovel greater handle strength. This is a patented feature of PONY Solid Shank Shovels.

Ask Your Jobber

AMES Since 1774

AMES-BALDWIN WYOMING CO.

Parkersburg, W. Va. North Easton, Mass.

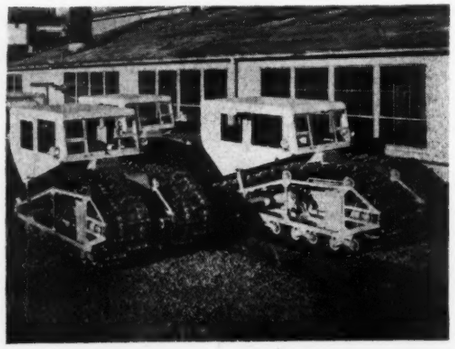
ABW PRODUCTS

SHOVELS FORKS
SPADES HOES
SCOOPS RAKES
POST HOLE DIGGERS
AGRICULTURAL HANDLES

CONSTRUCTION EQUIPMENT NEWS

SEPTEMBER, 1945 REVIEW of Construction Machinery and Materials

SNOW CRUISER, now in use by the Army Air Corps for search and rescue work in snowbound areas, but later to be available for post-war freighting of supplies and personnel to mining and logging camps and to trappers in the world's snow countries, is a lightweight, wide-tread tractor capable of transporting as much as 4,000 lb. in deep snow and up grades as steep as 35 deg. Built in four component parts—two tracks, power section and cab—the tractor can be dismantled readily for transportation in a plane. Removable cab of aluminum and steel allows tractor to be driven directly into the fuselage of the larger transport planes. Machine is capable of traveling 18 mph. under average conditions and 2 mph. under difficult snow conditions and steep grades. In areas where snow is as much as 50 ft. deep, cruiser does not sink beyond operating level. A low center of gravity prevents tipping on steep side hills. Deep grousers produce tractive effort even in "powder" snow. Cabs will accommodate three men and an



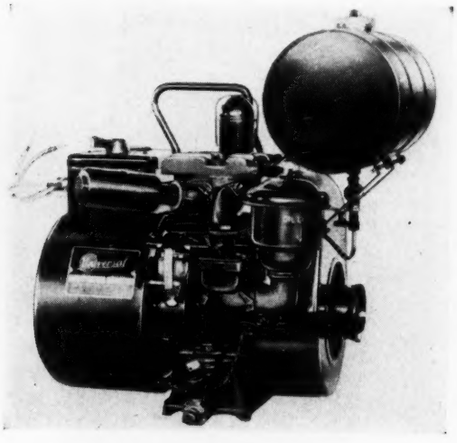
operator and, if necessary, can carry two litters. Radio equipped enabling communication with plane or other tractors. Windows on both side and rear can be pushed out to form emergency exits in the icefields where crevasses are frequently hidden by snow bridges.—**Iron Fireman Manufacturing Co., Portland, Ore.**

★ ★ ★

ADDITIVE TO DIESEL FUEL OILS is claimed to prevent corroding and sticking of injector nozzles and give top cylinder lubrication where ordinary oil fails, thus preventing formation of hard carbon and sticking rings. Gibraltar diesel fuel oil concentrate gives instant overhead lubrication, penetrates pores of metal, and prevents hard carbon from adhering to metal surface. Any carbon formed will be soft and, because metal pores are impregnated with oil capable of withstanding high temperatures, will be expelled from engine through ports. Is said to decrease fuel consumption by giving better lubrication and by compounding noncombustible components of fuel oil itself, which ordinarily become carbon. Manufactured from light mineral oil base, it is added at rate of 4 oz. to 10 gal. of regular diesel fuel oil and will mix thoroughly without agitation.—**Hood Refining Co., 157 N. Hamilton Ave., Greensburg, Pa.**

★ ★ ★

TWO NEW BATTERY CHARGING LIGHT PLANTS, Model 256-GH, 6 v., dc., 250 watts, and Model 312-GH, 12 v., dc., 300 watts, are now offered to replace pre-war Universal light plants of similar size. Both plants are driven by single-cylinder, four-cycle, air-cooled gasoline engines. Generators are mounted integrally to engine with provision for electric starting. Control box mounted on generator features switch with "start" and "neutral," also "high" and "low" charging positions, auto-



matic battery cutout, ammeter and battery lead wires. Air cleaner, 1-gal. gasoline tank, gasoline filter and muffler are mounted. Float feed carburetor and inclosed high tension magneto insure efficient operation from start. Proper engine speed automatically maintained by governor. Weighing 72 lb., new models are particularly suited to portable service, for maintaining automotive, truck and radio batteries and for such peace time applications as furnishing power for small homes, cottages, cabins, camps, farms and service in trailers and boats.—**Universal Motor Co., 346 Universal Drive, Oshkosh, Wis.**

...YOU GET THEM ALL IN ADAMS!

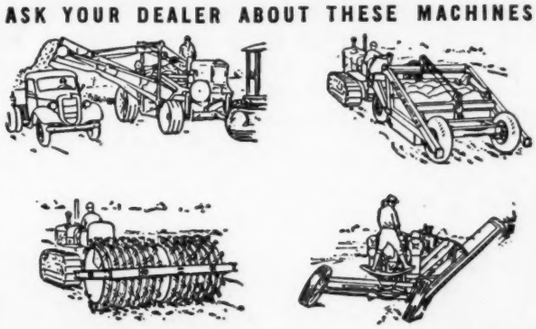
★Judged by any standards you like—power plant, engineering design, construction—Adams Motor Graders are unsurpassed in the three fundamental respects which, more than any others, determine efficient, profitable operation . . . *abundant power, long-life dependability, operating economy.*

Take the husky International Diesel engines used in Adams Graders—they're *long* on power and dependability, *low* on fuel consumption! . . . Most heavy-duty Adams Graders—even on the toughest jobs—operate on two gallons or less of low-priced Diesel fuel per hour.

Structurally, Adams Motor Graders have the rugged strength and rigidity to withstand hard usage. Add to this Adams' in-built adjustments for taking up wear at all critical control points, and you have a combination of dependability and economy that guarantees long years of efficient, low-cost operation.

See your nearby Adams dealer for full details and the other advantages of Adams machines.

ASK YOUR DEALER ABOUT THESE MACHINES

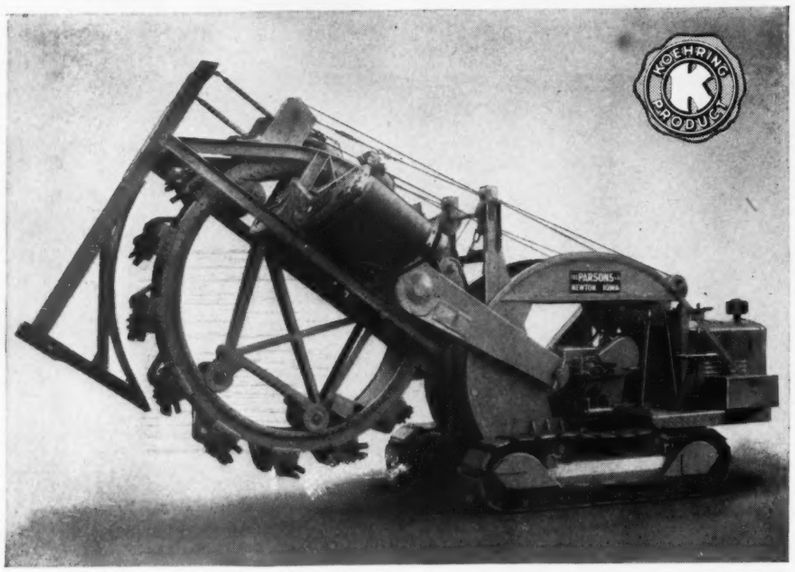


J. D. ADAMS MANUFACTURING CO.
INDIANAPOLIS, INDIANA

Adams

ROAD-BUILDING AND EARTH-MOVING EQUIPMENT

PARSONS
200 TRENCHLINER



WHY MODERN WHEEL MOUNTING MAKES FINE GRADING EASIER

Accurate trench depth adjustment is easy and simple with the new Parsons 200 Trenchliner. Fewer corrections, less backing up. Costly hand trimming eliminated. The modern direct line driven flexible mounted wheel can pivot on either the wheel drive shaft or on the boom foot. Dirt catching elevating slide tracks are eliminated. Three-part boom hoist lines last longer than the customary 2-part lines, can lift or lower either front or back of wheel. Smooth, fast-acting disc clutches control the wheel hoist mechanism. Combination of flexible double pivot mounting, 3-part lines and disc clutches speeds up depth adjustments, makes possible accurate grade control for close tolerance drainage specifications.

ASK FOR YOUR COPY OF THE NEW 200 TRENCHLINER CATALOG TODAY

THE PARSONS COMPANY

KOEHRING SUBSIDIARY **NEWTON, IOWA**

TRENCHING EQUIPMENT PARSONS

Construction for Reconversion

(Continued from page 87)

the press shop, building No. 12; (2) add an extension to No. 12a, and (3) build three authorized bays at the north end of a new sheet metal plant, building No. 4, shown in cross-section in an accompanying drawing. The authorized portion of the three-story building, No. 4, incloses about 88,000 sq.ft. of floor area. Construction of the entire building, to be extended under the agreement, will provide more than 900,000 sq.ft. of space in its length of 1,462 ft. Structures in the two building contracts at Flint were designed by Albert Kahn Associated Architects & Engineers, Inc., Detroit.

As the pictures show, both contractors have had to clear the ground by demolition of old structures to make way for the new buildings. Similar operations have been necessary at South Bend, where S. N. Nielsen, contractor, Chicago, has razed buildings erected as far back as the 1870's to make space for construction of modern structures, designed by Giffels & Vallet, Detroit, to step up Studebaker's peacetime truck production.

Construction Quantities

For the work authorized by WPB and put under construction during July at the Buick plant at Flint, the following quantities of materials are required:

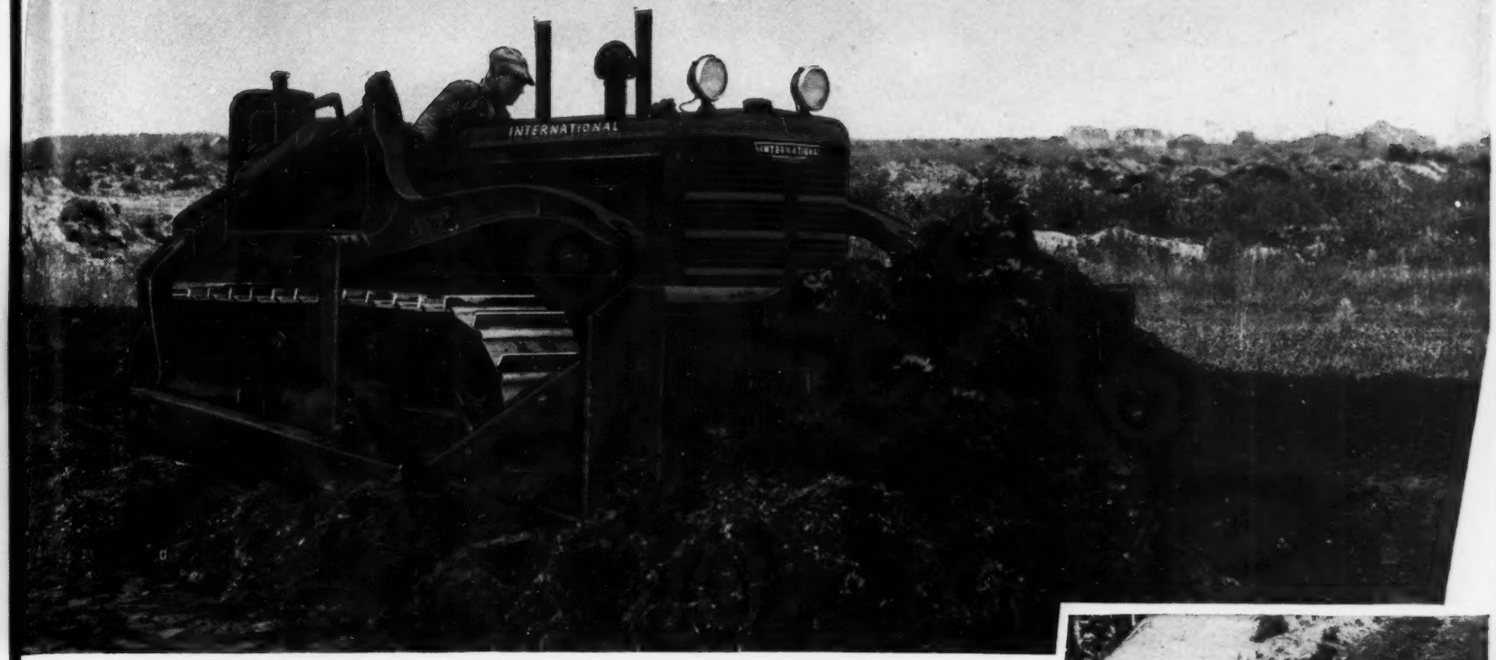
Building No. 12: 4,450 cu.yd. concrete, 113,000 brick, 86,000 sq.ft. roofing tile, 12,100 sq.ft. sash, 1,200 ft. storm sewers, 900 ft. sanitary sewers, 5,510 ft. underground sprinkler lines, 1,700 tons structural steel.

Building No. 4, three north bays only: 3,490 cu.yd concrete, 556,000 brick, 32,-300 sq.ft. roofing tile, 14,700 sq.ft. sash, 1,100 ft. storm sewers, 520 ft. sanitary sewers, 4,574 ft. underground sprinkler lines, 1,200 tons structural steel. For entire building No. 4, 8,500 tons of structural steel, 18,500 cu.yd. of concrete, 3,500,000 brick, 300,000 sq.ft. of concrete roof tile, and 160,000 sq.ft. of steel sash will be required.

Building No. 16: 1,100,000 brick, 8,800 cu.yd. concrete, 30,000 pieces of glazed tile, 3,000 tons structural steel, 240 tons

(Continued on page 126)

PLENTY OF PUSH...



and the Power is INTERNATIONAL!

International TracTracTors demonstrate how engine horsepower of a prime mover is effectively delivered to the bulldozer, scraper, ripper, wagon, etc. Through better balance by better weight distribution, plenty of push and pull is available for every piece of equipment designed for use with TracTracTors.

Operators like the way Internationals handle—their sure-footed traction—their maneuverability. And owners like the way Internationals stay on the job with minimum maintenance—their low operating costs, easily replaceable parts and overall durability—and the way they speed up the work cycle in earth moving—for example.

Get set for the projects ahead. Let an International Industrial Power Distributor recommend the kind and size of International TracTracTors, Industrial Wheel Tractors, and Power Units best suited for the jobs you have.

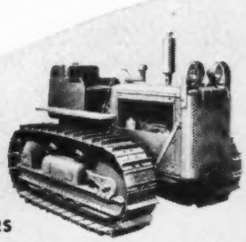
The upper picture shows an International TD-18 Diesel TracTracTor equipped with bulldozer moving a big bite of dirt on a highway project.

The smaller picture shows an International TD-9 Diesel TracTracTor nudging a large rock out of its way so the road can go through.

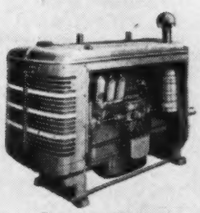
Industrial Power Division

INTERNATIONAL HARVESTER COMPANY

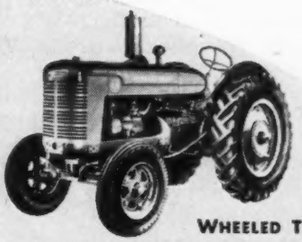
180 North Michigan Avenue — Chicago 1 Illinois



TRACTRACTORS



POWER UNITS

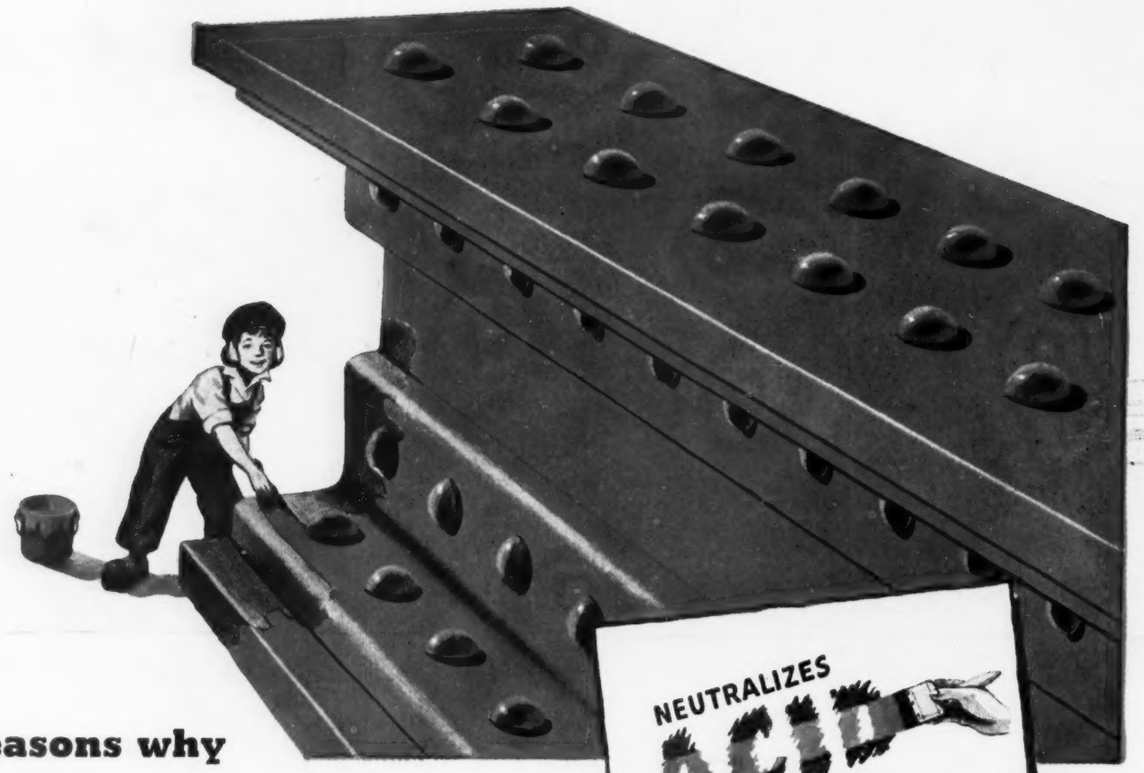


WHEELED TRACTORS

INTERNATIONAL — *Power for Victory*

INTERNATIONAL HARVESTER

Industrial Power — *Power for Peace*



2 Reasons why

RED LEAD

means Extra Rust Protection . . .

Why is Red Lead so widely accepted throughout industry as *The* metal protective paint?

Why are paints containing Red Lead so generally specified for safeguarding metal surfaces from the costly ravages of rust?

The reasons are many, but none are more noteworthy than Red Lead's ability to counteract acid conditions and to halt electrochemical action—both prime causes of rusting—as explained at right.

Still another important advantage of Red Lead is that it partially combines with the usual vehicles to form compounds generally known as "lead soaps." Due to their composition and the individual way in which these compounds form, the film obtained is highly water-resistant. In addition, lead soaps contribute to the formation of tough, elastic films that "stick on the job."

Remember, too, that Red Lead is compatible with practically all vehicles commonly used in metal protective paints, including phenolic and alkyd resin types.

Specify Red Lead for ALL Metal Paints

The value of Red Lead as a rust preventive is most fully realized in a metal paint where it is the only pigment used. However its rust-resistant properties are so pronounced that it also improves any multiple pigment paint. No matter what price you pay, you'll get a better metal paint if it contains Red Lead.

NEUTRALIZES ACID

1 Red Lead has the ability to counteract acid conditions which are recognized as accelerators of rust. Structural steel is exposed to such environments because acid forming compounds are carried by the atmosphere in the form of gas, smoke and moisture. Red Lead has a neutralizing effect on these conditions as it is essentially a *basic* pigment with the ability to develop and maintain, for a prolonged time, a mild alkaline environment at the surface of the metal. Authoritative tests show that, as a result, Red Lead inhibits the process of corrosion. In short, metal paints, too, should "stay on the alkaline side."

2 Another outstanding reason Red Lead means *extra* rust protection is the unique way it shields metal surfaces with a protective film. Rusting is fundamentally an electrochemical process in which weak currents are generated which cause iron to become soluble in the lowest state of oxidation. Red Lead has properties through which this iron is rapidly converted to a stable compound that forms an adherent film. The formation of this protective shield halts electrochemical action, thus preventing further corrosion.

Write for New Booklet

"*Red Lead in Corrosion Resistant Paints*" is an up-to-date, authoritative guide for those responsible for specifying and formulating paint for structural iron and steel. It describes in detail the scientific reasons why Red Lead gives superior metal protection. It also includes typical specification formulas. If you haven't received your copy, address nearest branch listed below.

* * *

The benefit of our extensive experience with metal paints for both underwater and atmospheric use is available through our technical staff.

NATIONAL LEAD COMPANY: New York 6, Buffalo 3, Chicago 10, Cincinnati 3, Cleveland 13, St. Louis 1, San Francisco 10, Boston 6 (National-Boston Lead Co.); Pittsburgh 30 (National Lead & Oil Co. of Penna.); Philadelphia 7 (John T. Lewis & Bros. Co.)

DUTCH BOY RED LEAD

SERVICE BY THE TON

CHEVROLET TRUCKS for 1945

CHEVROLET

Your truck is an important part of your service. The loads that it hauls keep you in business. Your trucking jobs demand equipment that will serve you satisfactorily and economically.

Low first cost, low operating cost and low maintenance cost are the main factors in successful truck operation.

Chevrolet trucks, with their built-in values, are the most economical to buy, to operate and to maintain. They are built for tough truck work. They are built to last longer. They will serve your business for thousands of ton-miles. For these reasons, truck users bought more Chevrolet trucks than any other make in seven of the last nine prewar years.

Your Chevrolet dealer can supply the right truck for your trade. He can increase the payload capacity, if you desire, by the installation of auxiliary axles, springs, bodies or trailers.

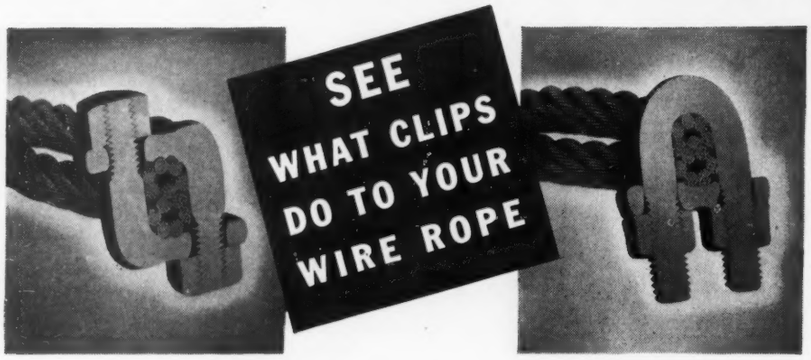
Buy only as much truck as you need. Buy a Chevrolet truck. It's payload, not chassis weight, that pays profits.

1 OUT OF EVERY 3 TRUCKS IS A CHEVROLET

Keep on Buying War Bonds

CHEVROLET MOTOR DIVISION, *General Motors Corporation*, DETROIT 2, MICHIGAN

Protect Preformed Rope with "FIST-GRIP" clips



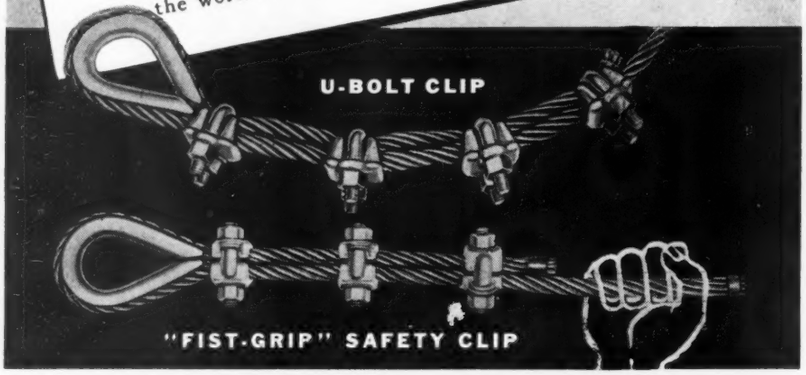
Look at this cross-section view of what happens to wire rope — when "Fist-Grip" Safety Clips are used . . . and when "Finger-Pinch" U-bolts are used. Notice how "Fist-Grip" Safety Clip holds rope with scarcely any change in its original shape . . . and how "Finger-Pinch" bolt crushes the rope as evidenced by the distorted hemp center under the "U".

Both clips tightened to exactly same tension with torque-indicating wrench.

why "FIST-GRIP" clips are better for rope

Improved bearing surfaces of "Fist-Grip" Safety Clips deliver even, firm pressure on all parts of rope, thus keeping it straight and strong — preserving the extra quality you paid for when you specified "preformed". "Fist-Grip" clips deliver full rope strength with less clips. 3 do the work of 4 U-bolts. They're easier to install too. Nuts are on opposite sides. Made in identical halves, they can't be put on backwards. The only clips with drop-forged bolts.

Order a few "Fist-Grip" Safety Clips today. Test them. Discover their time-saving, money-saving, material-saving advantages.



Distributed through mill, mine and oil field supply houses. Send for Laughlin's catalog of wire rope and chain hardware. Address Dept. 1, The Thomas Laughlin Co., Portland 6, Me.

LAUGHLIN

THE MOST COMPLETE LINE OF DROP-FORGED WIRE ROPE AND CHAIN FITTINGS

(Continued from page 122)

reinforcing steel, 61,000 sq.ft. steel sash, 65,000 sq.ft. glass, 167,000 sq.ft. roofing, 167,000 sq.ft. lin. cork insulation, 151,000 sq.ft. roofing tile, 25,000 sq.yd. wood block floor, 3,000 lin.ft. railroad siding facilities, 118,000 sq.ft. monitor skylight, 3,500 sprinkler heads, 45,000 sq.ft. asbestos-protected metal siding, 200,000 sq.ft. manufacturing floor area.

Equipment and Labor

Accompanying photographs indicate the equipment employed by the two contractors in demolishing obsolete structures and starting concrete structures. Thorgersen & Ericksen purchase ready-mixed concrete which is chuted to the forms in accessible locations and handled by crane and bucket or by concrete carts in other places. Darin & Armstrong have set up a central mixing plant utilizing a 2-yd. Mixmobile unit stationed under a batching plant, as shown by one of the photographs. The tower hopper of the Mixmobile discharges concrete into open-body end-dump trucks equipped with rear-end gates for unloading concrete.

Skilled construction labor is short throughout the entire area surrounding Detroit, and the two contracts at the Buick plant suffer somewhat, along with others, from this shortage. Termination of war contracts following the Japanese surrender brought only partial improvement in this condition, as not many of the released war workers were skilled construction craftsmen. A standing invitation still is open to workers in almost any skilled trade, including steel erectors, carpenters, bricklayers and electricians.

Direction—Buick's plans for rapid post-war expansion have matured under the constant urging of Harold E. Curtice, manager of the division and vice president of General Motors. Changes and improvements at the plant are being made under immediate supervision of the works engineering department, headed by Harold E. Hardenbrook, works engineer. L. L. Scott is assistant works engineer, and A. F. Sheldon is design engineer. In addition to the structures designed by the Albert Kahn organization, current construction includes additions totaling about 25,000 sq.ft. designed by the works engineering department. One of these structures, for 18,000 sq.ft., is being built by Cunningham & Rudy, Detroit.

Operations on the two major projects are directed for Albert Kahn Associated Architects & Engineers by P. G. Fleck, project manager, with Paul Page as field superintendent on the job. For the principal contractors, Clyde Perkins is superintendent for Darin & Armstrong, and

(Continued on page 130)

ON WHICH *Oil* DO YOUR PISTONS DEPEND?

A lazy oil that only *LUBRICATES...*

...OR HARD-WORKING

TALPEX

THAT NOT ONLY LUBRICATES BUT DOES 4 EXTRA JOBS

1. Has high detergency. Helps keep carbon, lacquer and foreign particles from adhering to pistons and rings, valves, ports.

2. Has exceptional Oxidation Stability. Holds to a minimum the formation of sludge, lacquer and other products of deterioration.

3. Has low Carbon-Forming Tendency. Reduces ring sticking and wear. Lengthens engine life.

4. Is non-corrosive to alloy bearings. Protects all lubricated engine parts against corrosion.

Such an oil is hard-working Shell Talpex. It does all of the jobs necessary to keep your engines on the go, day in and day out.

If the oil you now use is not doing all these jobs, it's lazy—should be changed to hard-working Talpex. Contact Shell Oil Co., Inc., 50 West 50th Street, New York 20, N. Y., or 100 Bush Street, San Francisco 6, Cal.

SHELL

TALPEX

For trucks, buses, tractors, shovels, stationary and marine Diesels.

Regardless of where or how wire rope is used, the work is generally plenty tough. Heavy loads, bending stresses, abrasion, and sudden strains are only a few of the things that make it so.

"HERCULES"(Red-Strand) Wire Rope is designed to meet just such conditions. The first step in its manufacture is the determination to produce a product which will be consistently long lasting... dependable... economical.

Proof is in performance, and for over sixty years, this tough and dependable wire rope has demonstrated its ability to meet the requirements of peacetime progress, as well as the demands of great emergencies.

In "HERCULES" there is a correct type and construction of wire rope for every heavy duty purpose, as it is made in both Round Strand and Flattened Strand constructions—all of which can be furnished either Preformed or Non-Preformed.

MADE ONLY BY

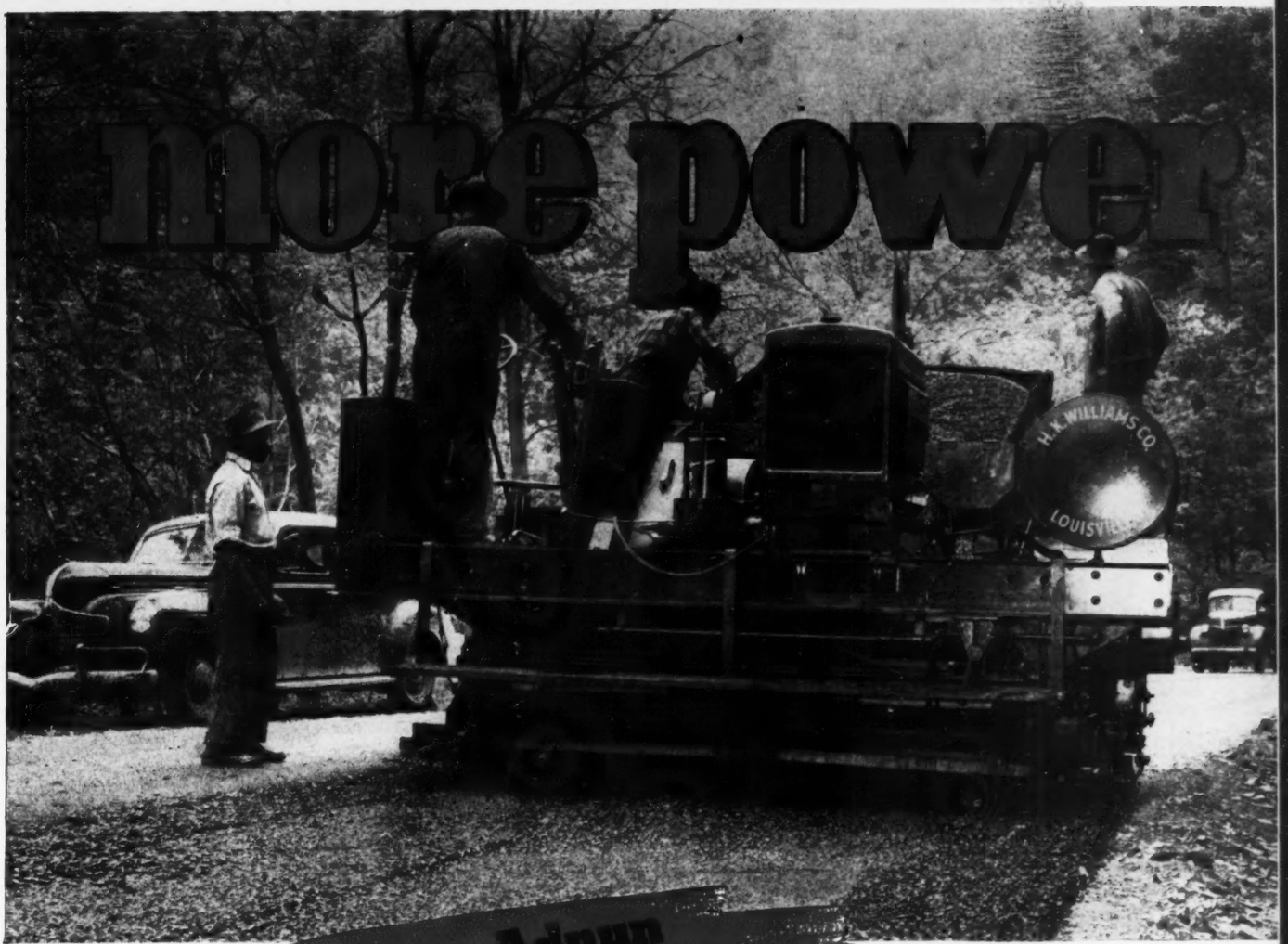
A. LESCHEN & SONS ROPE CO.

WIRE ROPE MAKERS — ESTABLISHED 1857

5909 KENNERLY AVENUE — ST. LOUIS, MISSOURI, U. S. A.

NEW YORK . . . 90 West Street
CHICAGO . . 810 W. Washington Blvd.
DENVER . . . 1554 Wazee Street

SAN FRANCISCO . . 520 Fourth Street
PORTLAND . . 914 N. W. 14th Avenue
SEATTLE . . 3410 First Avenue South



. . . with an Adnun Black Top Paver

Equipped with a new, more powerful gasoline engine, the Adnun black top paver is winning praise from experienced road-building men all over the country. Husky, economical, this 6-cylinder power plant makes huge, heavily loaded trucks *"pushovers"* for an Adnun. Operating smoothly and efficiently at all speeds, the Adnun handles loaded trucks with ease on any grade . . . while laying the mix according to specifications.

Adnun pavers *remain* in peak operating condition, because they are built for hard service. The rigid, cross-braced frame is more than adequate to absorb the shocks imposed by heavy trucks . . . bearings and shafts are kept in line. Power take-off is through heat-treated, alloy steel bevel gears, fully enclosed and running in oil, mounted on anti-friction bearings. Rear rollers are mounted in cast steel frames and the cutter bar is fully enclosed, can't be bent or warped.

For further details on these new, powerful pavers ask an Adnun owner, see your nearest Foote Distributor or write direct.

THE FOOTE COMPANY, INC.

1910 State Street **Nunda, N. Y.**

The World's Largest Exclusive Manufacturers of Concrete and Black Top Pavers

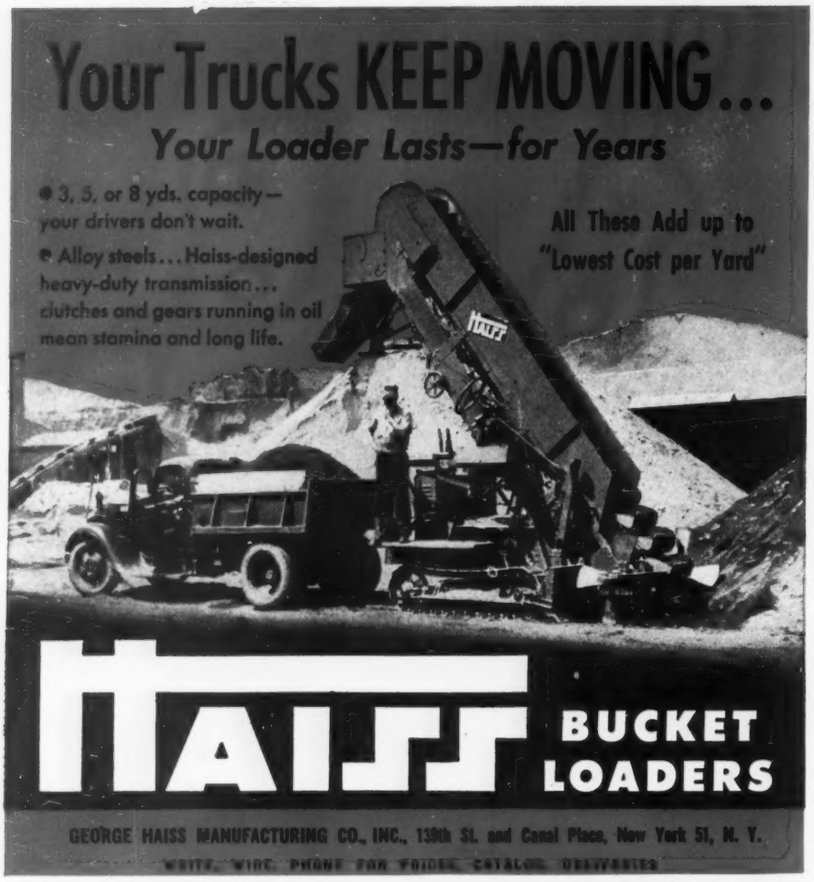
ARMY E NAVY

ADNUN

TRADE MARK REGISTERED

BLACK TOP PAVER

WITH CONTINUOUS COURSE CORRECTION


Your Trucks KEEP MOVING...
Your Loader Lasts—for Years
• 3, 5, or 8 yds. capacity—your drivers don't wait.
• Alloy steels... Haiss-designed heavy-duty transmission... clutches and gears running in oil mean stamina and long life.
All These Add up to "Lowest Cost per Yard"
HAISS BUCKET LOADERS
GEORGE HAISS MANUFACTURING CO., INC., 139th St. and Canal Place, New York 51, N. Y.

MALL Gasoline Engine Chain Saw. Available in many cutting capacities. Also Pneumatic and Electric models.

MALL Chain Saw cuts piling, timbers and planks with speed and accuracy—simplifies heavy industrial construction. Powerful 2-cycle gasoline engine has handle throttle and stall proof clutch—starts easily—uses very little fuel. 360 degree index permits horizontal, vertical and any angle cuts. Pneumatic models can be used to cut piling under water. Electric chain sharpeners are available.

Write for name of Distributor nearest you. Demonstrations can be arranged.

MALL TOOL COMPANY, 7757 South Chicago Ave., Chicago 19, Ill.

ARMY E NAVY

Mall REG. U.S. PAT. OFF. PORTABLE POWER TOOLS

(Continued from page 126)

Harry Johnson for Thorgersen & Ericksen.

Other New Plant Construction

Reports have been received from all parts of the country of new plants under construction, or planned for early construction, by various manufacturing units of the automotive industry. Among the places named in these reports are the following:

Flint, Mich.—In addition to the work being done at the Buick plant, it has been reported that the Chevrolet Division of General Motors will build at Flint a new assembly plant with a floor area of more than 1,000,000 sq.ft. It is said that the contract for this plant is held by the J. A. Utley Co., Detroit. In conjunction with the assembly plant, the Fisher Body Division will erect a new plant to supply bodies for the Chevrolet assembly lines.

Pontiac, Mich.—A building with a floor area of 360,000 sq.ft. is being added to the GMC plant at this place to increase post-war production of buses.

Detroit, Mich.—Among the jobs under way at automotive plants in the Detroit metropolitan area are an addition of a seventh floor to one of the main buildings at the Hudson plant and a new building for Dodge Truck.

Columbus, Ohio—A plant to employ more than 5,000 persons by the Ternstedt Manufacturing Division of the Fisher Body Division of General Motors is under construction at Columbus. Contracts for the work have been awarded as follows: excavation, Mauger Construction Co., Columbus; sewers, National Construction Co., Cleveland; structural steel, R. C. Mahon Co., Detroit; power house, Dravo Corp., Pittsburgh. Limited approval for construction of this project was given by WPB on June 30, and excavation began July 5.

Cleveland, Ohio—Definite post-war plans for Cleveland include two new plants by the Chevrolet Division, one for assembly of cars and one for the manufacture of parts.

Sandusky, Ohio—A new plant by the New Departure ball-bearing division of General Motors is definitely scheduled for construction at Sandusky.

Cincinnati, Ohio—Plant remodeling is in progress at the Chevrolet plant in this city.

Hamilton, Ohio—The Fisher Body Division has plans for erection of a new stamping plant at Hamilton.

Wilmington, Del.—A new plant of about

(Continued on page 136)

THE BIG CONSTRUCTION PROGRAM IS ON!

KABLE TRAC-DOZERS—are available in either 'Straight' or 'Angle' blade models and can be used with single or double drum, front or rear mounted, power units.

ISAACSON KABLE TRAC-DOZERS *Will be on the job!*

THE POST WAR ERA IS HERE. We are now entering a period marking the beginning of a five billion dollar construction program. Railroads, highways, airports and other large construction projects like the one pictured, are under way. These jobs will go to the contractor who has modern, quality built equipment with a reputation for low operating and low maintenance cost.

The Isaacson Kable Trac-Dozer has earned a wide reputation for continuous, profitable operation on rough, tough western jobs. Much of this reputation is the result of good *balance*. The Isaacson Kable Trac-Dozer is engineered for *balance* with your tractor. Load weight is properly distributed. This reduces wear . . . prolongs equipment life . . . and at the same time assures good traction. An Isaacson Kable Trac-Dozer gives you smooth, fast cable operation . . . powerful high lift . . . instant low drop . . . low cost yardage . . . fast dirt moving.

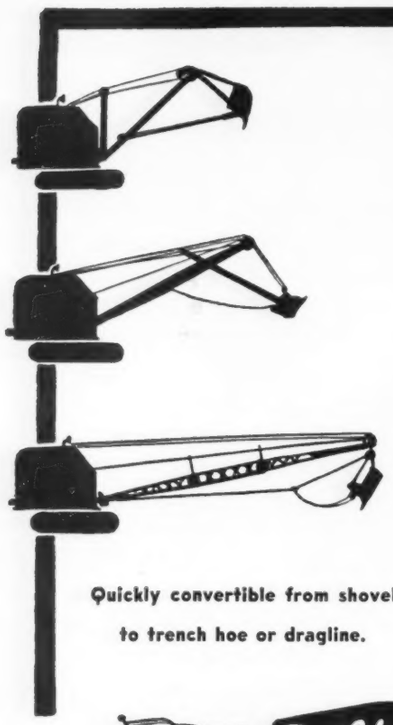
"Engineered for Balance"

Write direct today for complete descriptive literature—be equipped for big jobs ahead.

ISAACSON

Tractor Equipment

A PRODUCT OF THE ISAACSON IRON WORKS • SEATTLE



Quickly convertible from shovel to trench hoe or dragline.

Here's the truck and crawler assembly of a Buckeye Clipper. Its rugged construction—simple design—assures a far greater service life—less time out for repairs.

BIG — treads are 22 inches wide with 9 inch pitch!

STRONG — both treads and sprockets are of heat-treated, alloy steel!

The crawler assembly — built in its entirety in the Buckeye shops — is typical of the superior design and construction found throughout the Clipper. Crawler is the well-known Buckeye patent, non-clogging, self-cleaning type. Tapered roller path below swing gear supports weight of machinery deck — stress and side play are removed from center pin.

Added to the inbuilt qualities of stamina, high productivity and low cost operation is the exclusive "Mevac" system — metered vacuum power control — similar to that used for years on big highway trucks. "Mevac" reduces operator fatigue to a minimum — all shovel functions respond to a flick of the operator's wrist on the short "Mevac" control handles. Send for 24-page illustrated booklet, "The Age of the Clippers," and learn how these easy-to-operate ½ and ¾ yard shovels can help you cut costs in your postwar operations.

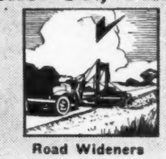
Built by Buckeye

Buckeye Traction Ditcher Co., Findlay, Ohio

Convertible Shovels

Trenchers

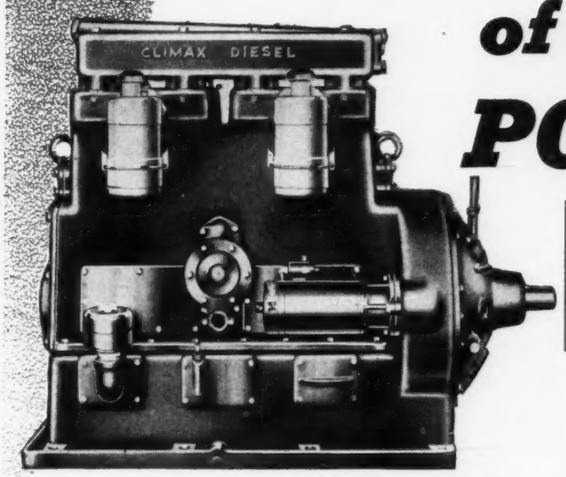
Tractor Equipment


Road Wideners

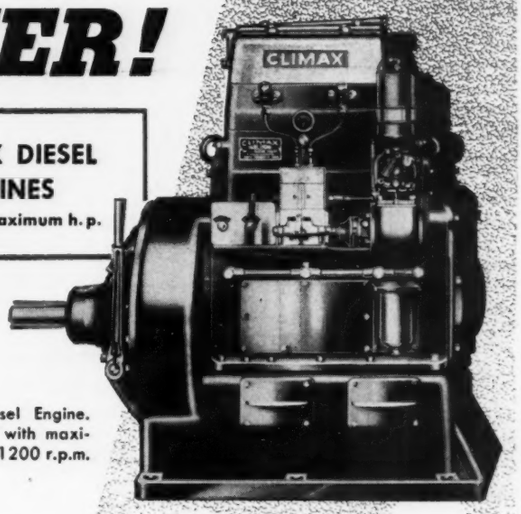
R-B Finegraders

Spreaders

LITTLE GIANTS of Diesel POWER!



CLIMAX DIESEL ENGINES
22 and 44 maximum h. p.



CLIMAX MODEL D297 Diesel Engine. Four cylinder, full Diesel, maximum rating 44 h.p. at 1200 r.p.m. Also available with speed reduction units.

CLIMAX MODEL D148 Diesel Engine. Two cylinder, full Diesel with maximum rating of 22 h.p. at 1200 r.p.m.

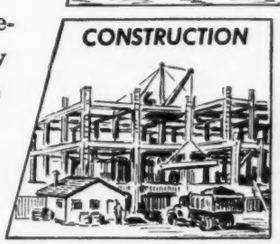
WHEREVER a compact, space-saving source of dependable, economical power is required, these small Climax Diesel Engines are to be found doing *yeoman* service—driving fans and blowers, pumps, compressors, conveyors and hoists, small locomotives and power saws, powering boats, supplying auxiliary mechanical power on large vessels.

These smooth-running Climax Diesels—strongly built with one-piece construction of cylinders and crankcase—consume only cheap, low grade, standard fuel oil. They are 4-stroke-cycle type, solid injection, compression ignition engines that start at the touch of a button, by local or remote control. Dependable, quick starting, easy to operate, and safe.

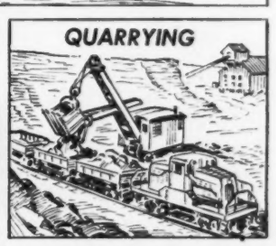
Standard equipment includes American Bosch fuel pump and injection nozzles, positive lubrication and cooling and electric starting equipment. For complete information and specification bulletin, write Climax Engineering Company, Clinton, Iowa.

MARINE

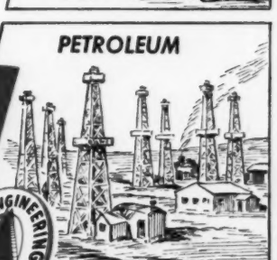
CONSTRUCTION



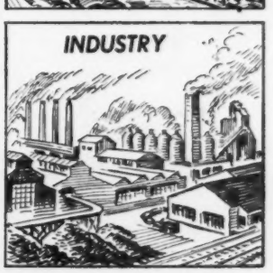
QUARRYING



PETROLEUM



INDUSTRY



climax DIESEL
Builder of Climax BLUE STREAK ENGINES and GENERATING SETS

CLIMAX ENGINEERING COMPANY

POWER, LIGHT and STANDBY SERVICE

12 reasons why CLEVELAND SINKERS are PREFERRED...

1. Drop forged construction insures super-strength.
2. End-seating valve (used on most models) improves with use, prevents greater air consumption with long wear.
3. Big oil reservoir holds enough for four hour's steady operation.
4. Lubrication of rifle nut and bar prolongs their life 50%.
5. Complete lubrication of all parts of the machine insures longer wear of all moving parts.
6. Chrome plated spacer wears 3 times longer, insures full cushion on front end, avoids piston and side rod breakage.
7. Large areas of face contact hold parts in line, minimize wear at joints.
8. Floating chuck clutch prevents binding of piston.
9. Well designed exhaust port prevents freezing.
10. Throttle detents fully enclosed and well oiled.
11. Four pawl rotation—rugged and reliable.
12. Goose neck swivel air connection.

Many types, ranging from 32 to 78 lbs. in wet or dry construction, fully described in Bulletin 122. Ask for it!

MODEL H111

MODEL H10

MODEL H66

CLEVELAND ROCK DRILL DIVISION

THE CLEVELAND PNEUMATIC TOOL COMPANY

CABLE ADDRESS: "ROCKDRILL" • CLEVELAND 5, OHIO

Leaders— in DRILLING EQUIPMENT

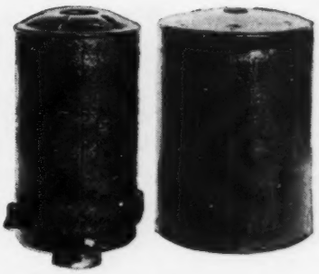
BRANCH OFFICES

Birmingham 1, Ala.	Lexington 19, Ky.	Salt Lake City 1, Utah
Butte, Mont.	Los Angeles 11, Calif.	San Francisco 3, Calif.
Denver 2, Colo.	Newton Highlands 61, Mass.	St. Louis 3, Mo.
El Paso, Texas	New York 6, N. Y.	Wallace, Idaho
Ironwood, Mich.	Philadelphia 30, Pa.	Washington 5, D. C.

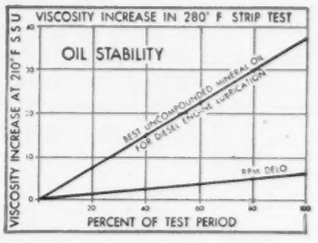
CANADIAN DISTRIBUTORS

Purves E. Ritchie & Son, Ltd., 658 Hornby Street, Vancouver, B. C.
Industrial Machinery Co., Ltd., 163 N. Water St., Halifax, Nova Scotia

How RPM DELO OIL stops filter clogging



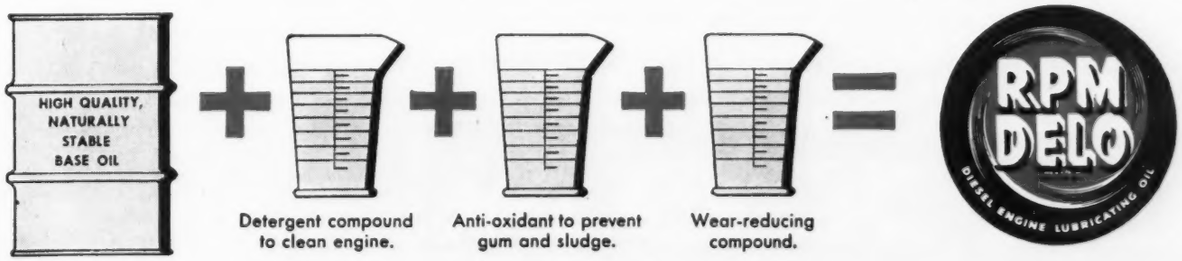
Powerful Anti-Oxidant effects of compounding material in RPM DELO Oil are graphically illustrated by cleanliness of this filter after 500-hour test under heavy duty conditions. Inherent stability of selected base stocks in RPM DELO Oil, plus detergent compounds assure minimum engine deposits, prevention of many costly shutdowns.


VISCOSITY INCREASE IN 280° F STRIP TEST
OIL STABILITY
VISCOSITY INCREASE AT 210° F S.S.U.
BEST UNCOMPOUNDED MINERAL OIL FOR DIESEL ENGINE LUBRICATION
RPM DELO
PERCENT OF TEST PERIOD

This Is How uncompounded oil clogged a regular commercial filter element after only 204 hours in a test run. The shiny sludge deposit is the result of oxidation of oil, plus iron, silica and water. In actual use, a clogged filter can result in stopped-up oil passages and excessive crankcase sludge, necessitating expensive overhauls for cleaning.

Same Type Filter from the same engine, operated on RPM DELO Diesel engine lubricating oil looked like this after 1234 hours. There is little deposit, oil flow is unimpaired. RPM DELO Oil prevents filter clogging two ways: 1. By maintaining piston rings in free working condition. 2. By minimizing oxidation of oil itself.

How RPM DELO Oil resists oxidation far more effectively than other oils is shown in this chart. Results were based upon increase of viscosity during severe laboratory tests. Write Dept. T-X, Standard of California, San Francisco 20, Calif., for more technical information on RPM DELO Diesel Engine Lubricating Oil.

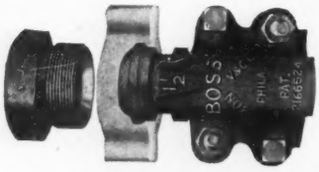

HIGH QUALITY, NATURALLY STABLE BASE OIL
Detergent compound to clean engine.
Anti-oxidant to prevent gum and sludge.
Wear-reducing compound.
RPM DELO
DIESEL ENGINE LUBRICATING OIL

STANDARD OF CALIFORNIA

RPM DELO Oil has world-wide distribution under the names: RPM DELO, Caltex RPM DELO, Signal RPM DELO, Imperial RPM DELO (CONCENTRATE)

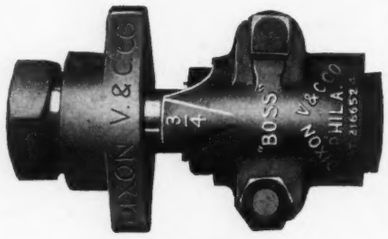
There's a Reliable DIXON *Coupling for Every Construction Job!*

No matter what the service requires, there's a DIXON coupling especially designed to provide an efficient, durable connection . . . on steam, air or liquid hose lines . . . high or low pressure . . . above ground or below. The following are typical items from the DIXON Quality Line.



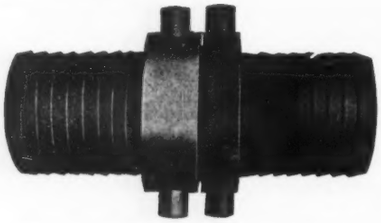
"G J-BOSS"
GROUND JOINT, STYLE X-34
FEMALE HOSE COUPLING

For high or low pressure steam, air and liquid hose. Ground Joint construction provides permanently leakproof, soft-to-hard metal seal when wing nut is tightened. "BOSS" Offset Interlocking Clamp anchors coupling to hose with a powerful, full-circumference grip, without pinching. Corrugated stem assures added holding strength. Made in sizes ¼" to 4", inclusive, and furnished with male or female spuds.



"G J-BOSS"
GROUND JOINT
AIR HAMMER COUPLING

The most efficient and reliable coupling for every pneumatic tool service. Strong, washerless, leakproof. No washers to replace—no danger of blow-offs. Furnished with tight-gripping "BOSS" Interlocking Clamp. Compact Type, Style XLB-61, ½" and ¾". Heavy Type, Style XHB-72, ¾" and 1".



"KING" SHANK COUPLINGS
FOR SUCTION and
WATER HOSE

Strong, durable couplings made of all malleable iron; malleable iron with brass nut; or all brass. Uniform in quality, threading and dimensions. Shanks have deep clean corrugations. Sizes: 1¼" to 8", inclusive.

"KING" COMBINATION NIPPLE
With Patented "COR-O-ZIG"
Corrugations

Made from malleable iron or brass, with two-way "Cor-o-Zig" corrugations and two lug wrench stops. Designed to fit straight end hose (without enlarged ends), and can be readily reset when necessary. Easy to insert in hose. Widely used in place of regular iron pipe nipples. Sizes: ½" to 8", inclusive.

Carried in Stock by Manufacturers and Jobbers of Mechanical Rubber Goods

DIXON
VALVE & COUPLING CO.
Main Office and Factory: PHILADELPHIA, PA.
BRANCHES: CHICAGO · BIRMINGHAM · LOS ANGELES · HOUSTON

(Continued from page 130)

1,000,000 sq.ft. floor area for assembling Buick, Oldsmobile and Pontiac automobiles has been started at Wilmington. The plant will need about 3,000 employees, on a two-shift basis, when it begins operating.

Atlanta, Ga.—An assembly plant inclosing 500,000 sq.ft. of floor space is being built by the Ford Motor Co. at this city. Land has been purchased at Doraville, not far from here, as the site of a new assembly plant for Buick, Oldsmobile and Pontiac cars.

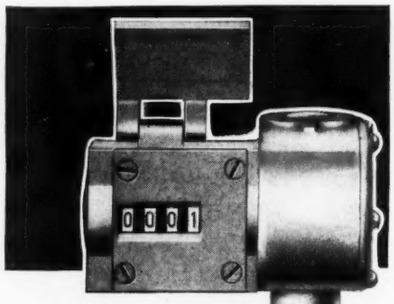
St. Louis, Mo.—The Ford Motor Co. is building an 850,000-sq.ft. plant at this place.

Kansas City, Mo.—Land has been acquired near Kansas City as a site for an assembly plant for Buick, Oldsmobile and Pontiac automobiles. In addition, the Chevrolet assembly plant at Kansas City is being remodeled.

New Brunswick, N. J.—A new storage battery manufacturing plant is being built on land recently purchased at this place by the Delco-Remy Division of General Motors.

Seattle, Wash.—Construction of a parts

(Continued on page 140)



PRODUCTIMETER
HOUR METERS
for internal combustion engines

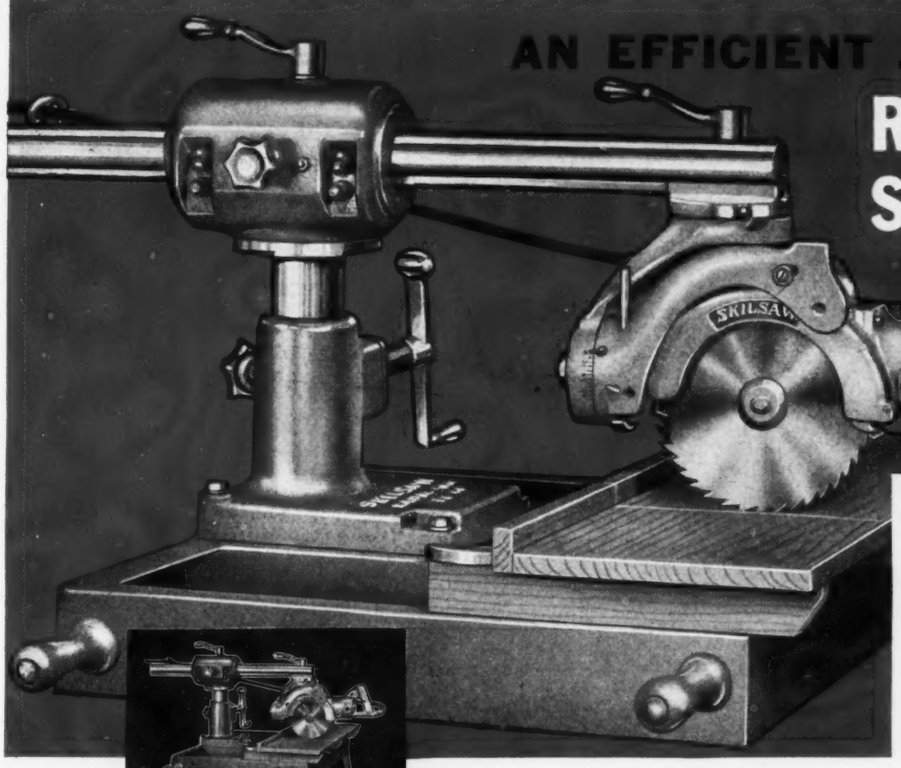
register actual running hours of operation, just as a speedometer registers mileage. Specially applicable to gas or Diesel engines, Hour Meters provide valuable readings that enable owners and operators to maintain motorized construction equipment at highest efficiency. Use them on compressors, graders, mixers, tractors, bulldozers.

Compact, easily adaptable . . . send for complete details in

Catalog No. 20

DURANT MFG. COMPANY
1980 N. Buffum St. Milwaukee 1, Wis.

THIS *New* RADIAL ARM converts PORTABLE SKILSAW INTO AN EFFICIENT JOB-SITE RADIAL SAW!



Also available with steel legs

● In a few minutes you can attach SKILSAW Model "77", "825" or "87" to this radial arm and be all set to save time on all the cuts shown at the right. You save layout time . . . one piece serves as a pattern for thousands. You save cutting time by gang-cutting materials. You save material by cutting random lengths into usable lumber.

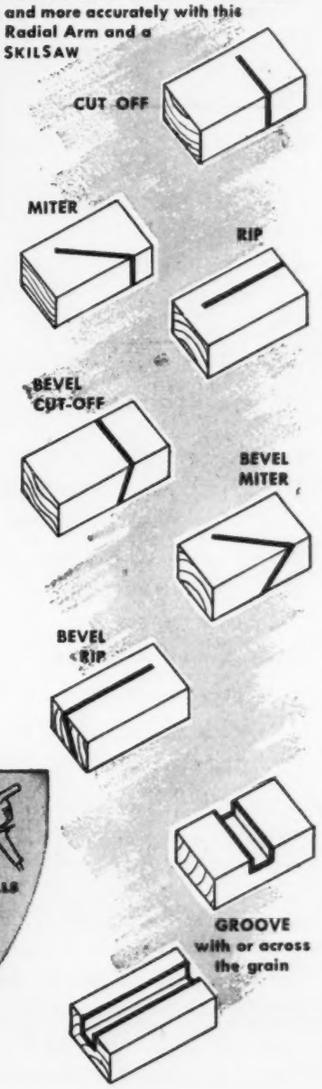
THEN . . . you can quickly detach Portable SKILSAW and take it right to the work . . . make every cut for which Portable SKILSAW is famous, from foundation forms to sheathing and roof decking.

See your distributor for a demonstration!

SKILSAW, INC. 5033-43 Elston Ave., Chicago 30, Ill.

Factory Branches in All Principal Cities

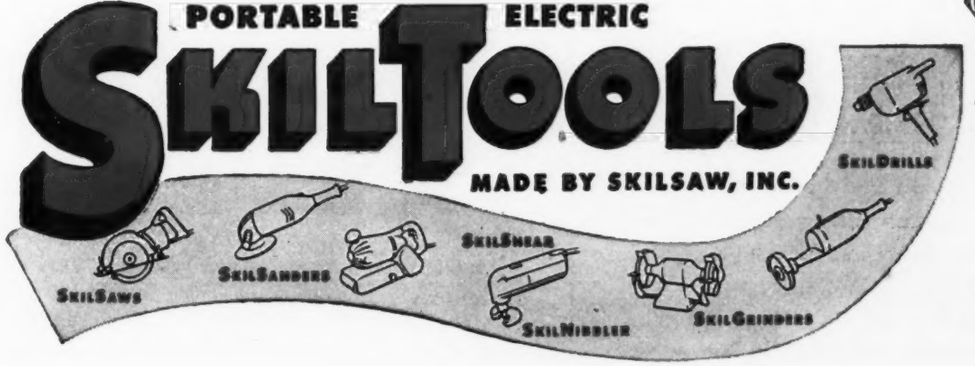
You can make all these cuts faster and more accurately with this Radial Arm and a SKILSAW

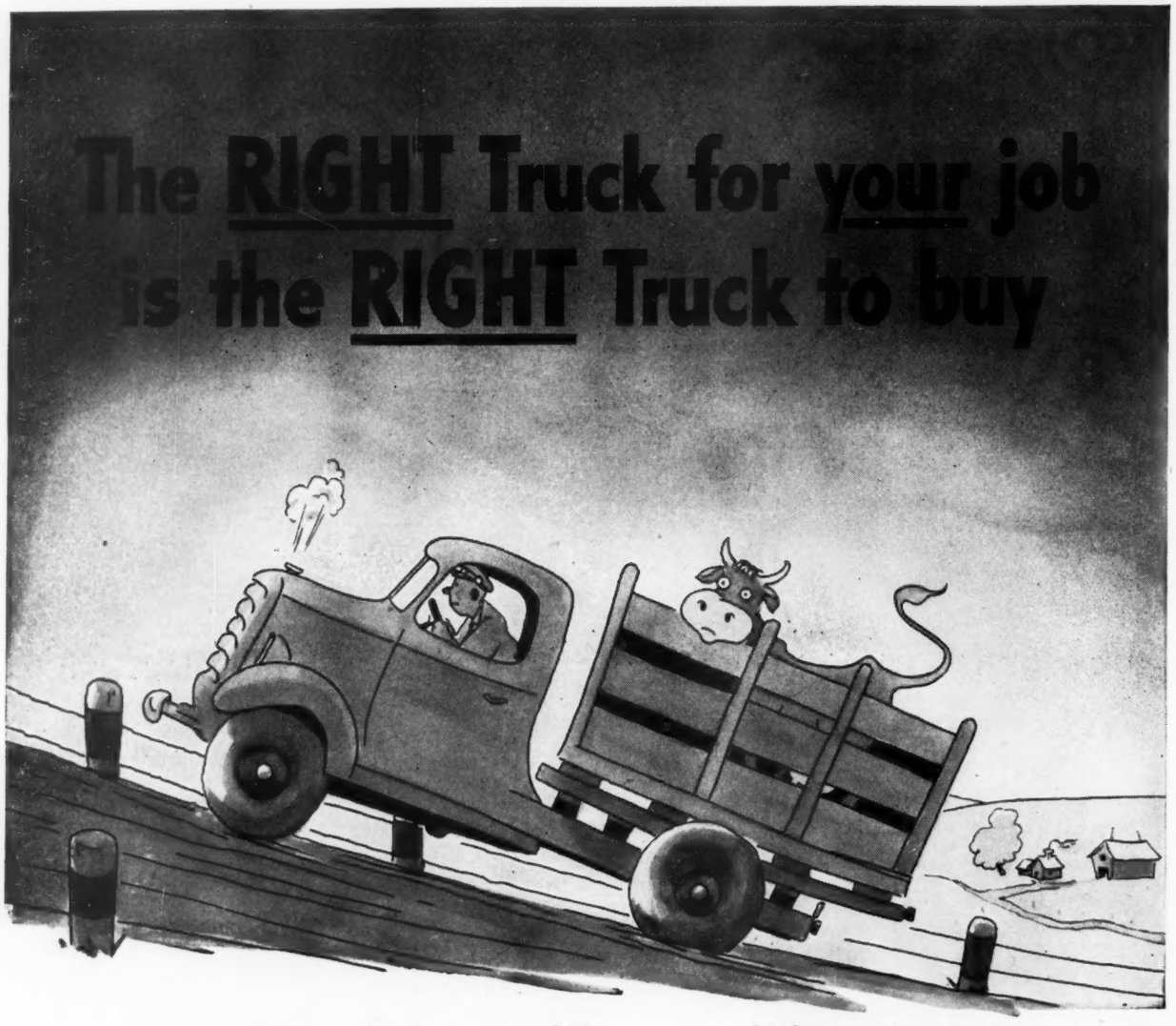


PORTABLE ELECTRIC

SKILTOOLS

MADE BY SKILSAW, INC.





"Every time I start up a hill . . . . . this happens!"

Bogging down on the hills this way has taught many a truck operator plenty about how axle ratios affect truck performance. Some ratios give lots of speed and zip on the level, but they lose it all on the hills. Other ratios have plenty of pulling power—at the cost of time-saving speed on level stretches. With either ratio alone, the truck is often a misfit.

Obviously, what this truck needs is a Timken 2-speed axle with Easy Power Shift. Then it will have *both* high speed on the level and more power—more speed on the hills.

How Do Your Vehicles Measure Up?

When buying a truck you'll get the right truck for your job and you'll be sure of better performance and more profit if you will do these three things: (1) analyze the job each truck must do; (2) study specifications and buy your trucks to fit your jobs; (3) protect your investment by good maintenance and careful operation.

Manufacturers will be ready soon with new vehicles to meet your needs. And Timken will be ready with the finest, most complete line of axles incorporating the greatest advances in the history of the axle industry. Ask about axles when you buy. Be sure you get Timken Axles—the accepted standard.

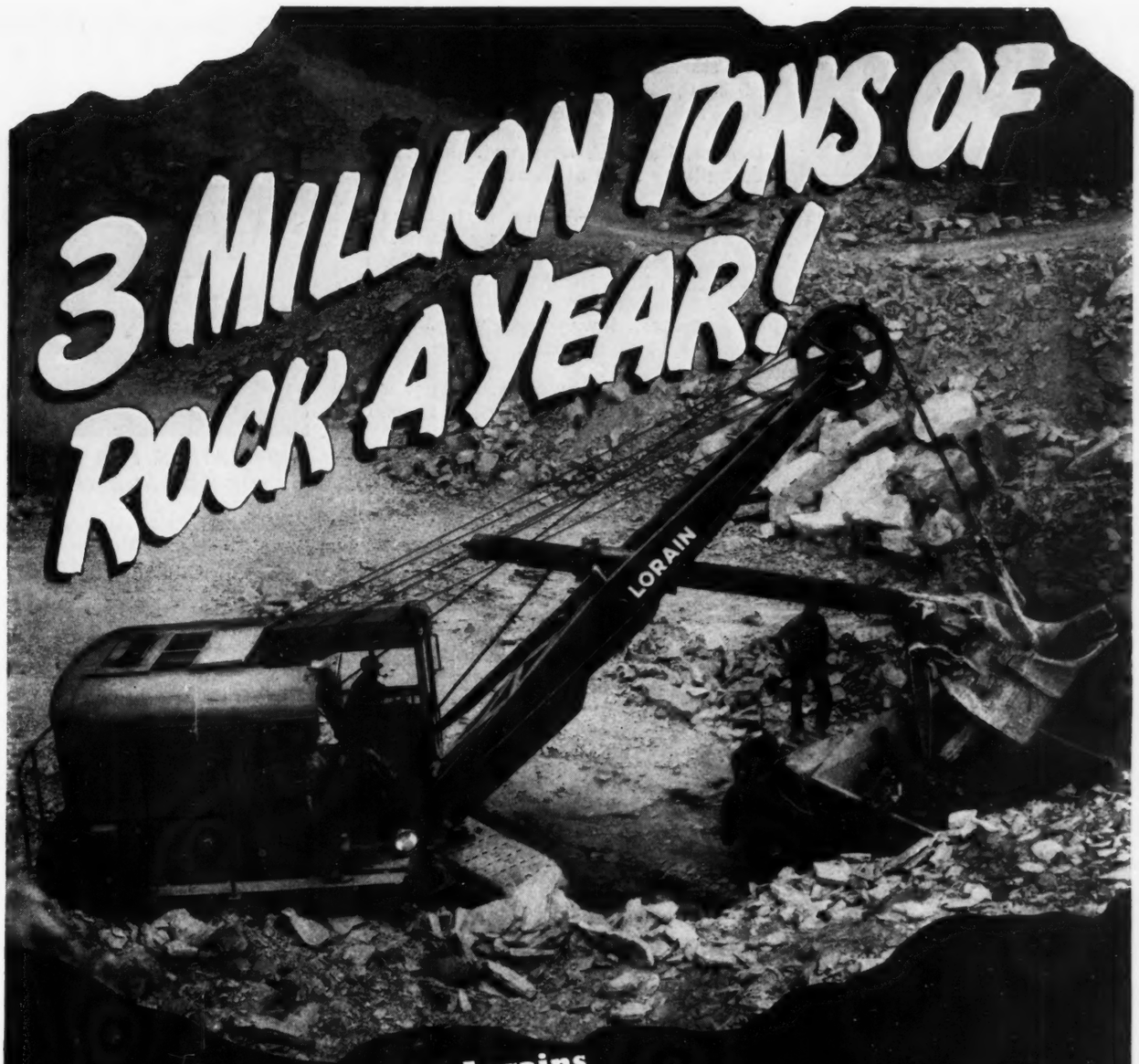
TIMKEN AXLES

TIMKEN

AXLES

THE TIMKEN-DETROIT AXLE COMPANY, DETROIT 32, MICH.
WISCONSIN AXLE DIVISION • OSHKOSH, WISCONSIN

3 MILLION TONS OF ROCK A YEAR!



Job-Tested Proof that Lorains Are Money-Makers in Rock . . .

A 3,000,000 ton payload of crushed rock in a single year. That's the story of Lorain performance and production on this quarrying operation* where each of five 2 yd. Lorain 82's averaged over 50,000 tons of rock a month for twelve consecutive months.

A steady rock diet like this means plenty of power—and Lorains are long on power which is applied through: (1) The Center Drive design which permits ganging-up full engine power on any one operation; (2) the Hydraulic Clutch that cushions impacts and shocks, absorbs stresses and strains, prevents engine stall and protects cable life.

Keep the 2 yd. Lorain 82 (with hydraulic clutch) in mind for those jobs where *big production means bigger profits*. For complete details get in touch with your Lorain distributor, now!

THE THEW SHOVEL COMPANY • Lorain, Ohio

*Location on request

Reg. Trade Mark

thew-Lorain

CRANES • SHOVELS • DRAGLINES • MOTO-CRANES

LUBRIPLATE
No. 130-A

LUBRICATION PLUS!

A SUPER LUBRICANT—A MARVELOUS ANTI-SEIZE COMPOUND—A REAL PROTECTION AGAINST RUST AND CORROSION. From the standpoints of general utility and wide diversity of important uses, we do not believe there has ever been a lubricant that compares with LUBRIPLATE No. 130-A. It has everything. The outstanding performance of this super-lubricant and its adoption by industry in general, and the Army and Navy are certainly adequate proof of its superiority. Write for copy of bulletin No. 6-41.

LUBRIPLATE
Lubricants definitely reduce friction and wear to a minimum. They lower power costs and prolong the life of equipment to an infinitely greater degree. LUBRIPLATE arrests progressive wear.

LUBRIPLATE
Lubricants protect machine parts against the destructive action of rust and corrosion. This feature alone puts LUBRIPLATE far out in front of conventional lubricants.

LUBRIPLATE
Lubricants are extremely economical for reason that they possess very long life and "stay-put" properties. A little LUBRIPLATE goes a long way.

Write for a booklet, "The LUBRIPLATE Film" written especially for your industry.

LUBRIPLATE
FISKE BROTHERS REFINING CO.
NEWARK 5, N. J.
TOLEDO 3, OHIO

(Continued from page 136)

depot by the Ford Motor Co. at Seattle has started with placement of 12 ft. of fill by the Puget Sound Bridge & Dredging Co.

Denver, Colo.—A new parts depot is to be built by Ford at Denver.

Memphis, Tenn.—A new parts depot is to be built and an assembly plant is to be extended by the Ford Motor Co. at Memphis.

Des Moines, Iowa—Ford will build a parts depot at this city.

Houston, Tex.—A new parts depot is to be erected promptly by Ford at Houston.

In addition to the work mentioned here by the Ford Motor Co., it should be said that new assembly plants are definitely scheduled for early construction in the northeastern United States and on the Pacific Coast. Also, the Ford Motor Co. is erecting new cafeteria buildings at its plants in Chester, Pa., and Dallas, Tex., and is putting cafeterias in existing buildings at Ypsilanti, Mich., Hamilton, Ont., Green Island and Buffalo, N. Y., Louisville, Ky., Somerville, Mass., Minneapolis-St. Paul, Edgewater, N. J., and Chicago.

Van Nuys, Calif.—At this place, not far from Los Angeles, General Motors is reported to have purchased land for an automobile assembly plant.

★ ★ ★

Rocket Plant

(Continued from page 99)

labor camp with a capacity of 15,000. Housing in this camp consisted principally of units accommodating twenty men each, made up by joining three 16x16-ft. prefabricated plywood huts into a demountable house 16x48 ft. in plan. Residents in the manual camp took their meals at three mess halls, seating 1,700 each, which operated on a continuous basis, day and night.

A non-manual camp for Naval, professional and office personnel provided woodframe barracks with a capacity of 1,120, increased to 1,425 by putting three men in a room. A separate cafeteria served the people in the non-manual camp.

To take care of the survey and engineering design work, Fraser-Brace employed 24 field parties and 250 men in the office and drafting room. When

(Continued on page 142)

LUBRIPLATE
No. 70

LUBRICATION FOR WHERE IT'S HOT AND WET!

LUBRIPLATE No. 70 is a medium density, grease type lubricant ideal for applications exposed to heat, steam and moisture. It does a wonderful lubrication job under all conditions. In processing and food plants where moisture, steam, heat and fumes are prevalent, it has no substitute. Machines lubricated with LUBRIPLATE No. 70 can be washed down with hot water without harming the lubricant in the bearings. LUBRIPLATE No. 70 prevents rust and corrosion.

Rx FOR YOUR MACHINERY

No. 3—Ideal for general oil type lubrication. Ring oiled bearings, wick feeds, sight feeds and bottle oilers.

No. 8—Because of its high film strength and long life reflects outstanding performance in most types of enclosed gears (speed reducers)

No. 107—One of the most popular grease type products for general application by pressure gun or cups.

No. 70—For a wide range of grease applications, especially at temperatures above 200 degrees F.

No. 130-AA—Known nationwide as the superior lubricant for open gears, heavy duty bearings, wire rope, etc.

BALL BEARING—This is the LUBRIPLATE lubricant that has achieved wide acclaim for use in the general run of ball and roller bearings operating at speeds to 5000 RPM and temperatures up to 300 degrees F.

Write for a booklet, "The LUBRIPLATE Film" written especially for your industry.

LUBRIPLATE
FISKE BROTHERS REFINING CO.
NEWARK 5, N. J.
TOLEDO 3, OHIO

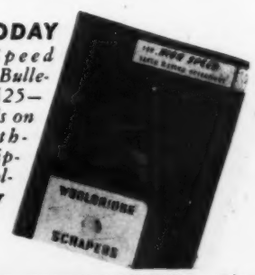
There's NO ZIG—NO ZAG!

Full power at all times and positive two wheel steering control coupled with the floating oscillating pivot of the Wooldridge Terra-Cobra, high-speed, self-propelled Earthmover make it possible to operate on soft, sloping, or inclined surfaces. Both units can freely tilt in opposite planes at the same time—even while the engine unit turns in either direction—without any danger of tipping—or damage resulting from exerted strains. This permits a Wooldridge Terra-Cobra to work safely in spots where others might "fear to tread." True directional steering also allows the Terra-Cobra to spread close to the edge of soft fills. Full details furnished on request.

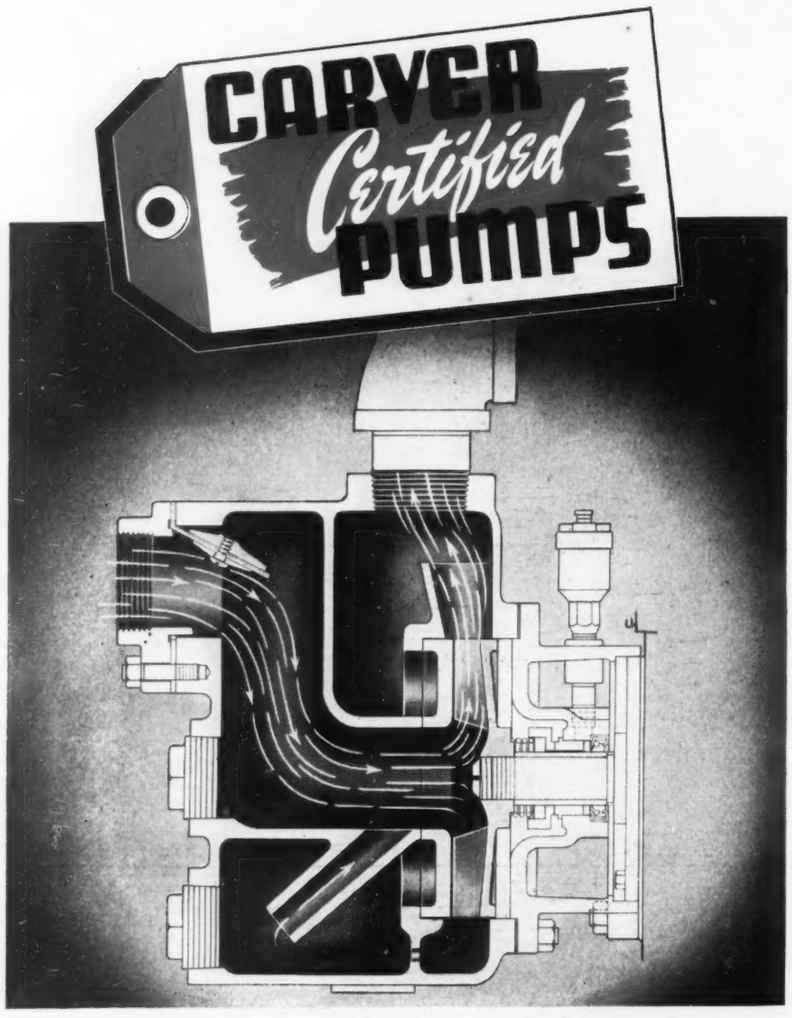
WITH POWER MAINTAINED ON BOTH WHEELS AT ALL TIMES

WOOLDRIDGE
TERRA COBRA
SELF-PROPELLED EARTHMOVERS

WRITE TODAY *for High Speed Earthmoving Bulletin No. TA-425—and for details on tractor earthmoving equipment get Wooldridge Scraper Bulletin W-210.*



WOOLDRIDGE MANUFACTURING CO.
SUNNYVALE • CALIFORNIA



Noted for trouble-free operation

● This cutaway view of a Carver Certified Pump shows why it has such a record for high, lasting performance. Note the smooth, unimpeded flow of water from suction to discharge, the scientific design of the recirculation tube. Exhaustive performance tests helped determine exactly the proper size, shape and angle of this vital part to provide fastest priming, peak efficiency and correct amount of recirculation to keep priming chamber free from clogging deposits of silt, sand or dirt. See your local Carver distributor for specifications or write direct.

THE CARVER PUMP CO.
Muscatine, Iowa

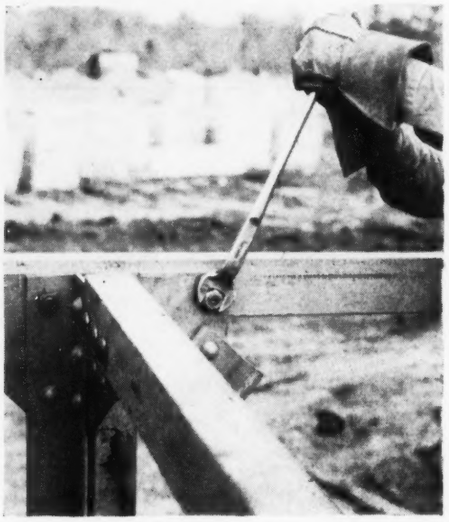
CARVER CENTRIFUGAL
Certified PUMPS

(Continued from page 140)

construction built up to its going rate, a large volume of blueprints was delivered daily to the construction contractors. This volume averaged 10,000 per week and at times amounted to as many as 10,000 in three days.

Building Design

For a plant handling and assembling explosives, as well as inert parts, in manufacture of rockets, safety is the primary design requirement. Buildings which house operations of a hazardous character, such as the handling of explosives, are designed to minimize the danger of explosion, to localize any explosion which may occur and to dissipate the energy of an explosive blast with the least possible damage to immediate surroundings in the structure itself and to other buildings at a distance. Accompanying photographs indicate some of the design features which attempt to control and minimize the hazards. In addition to heavy walls and barricades



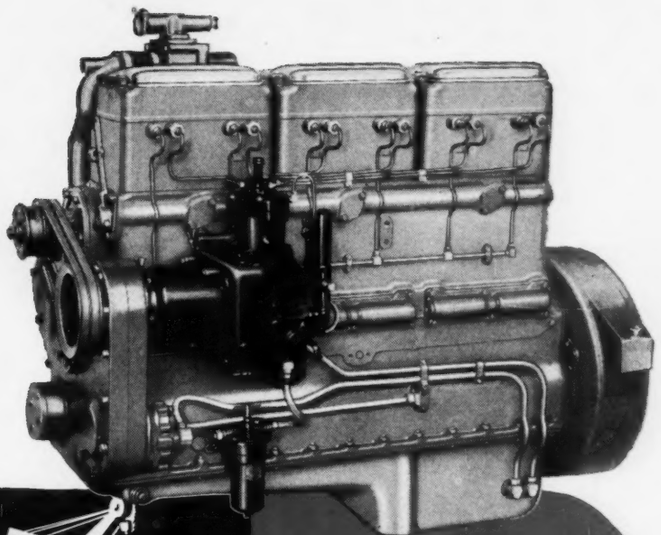
NUT ON RIVET BOLT is drawn up tight to apply self-locking feature, designed never to work loose.

which divide hazardous buildings into small sections and which control the direction of an explosive blast, the buildings themselves are so spaced as to put a safe distance between them, thus reducing to a minimum the possibility of propagating blasts from one building to another.

All hazardous buildings are equipped with explosion-proof electrical apparatus and fixtures, and these buildings also are doubly protected by elaborate grounding systems against both static electricity and lightning. Floors inside the build-

(Continued on page 146)

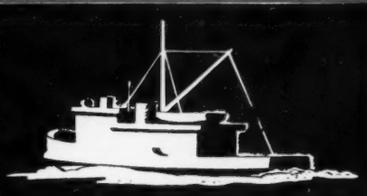
Jobs for PROVED POWER are jobs for CUMMINS DIESELS



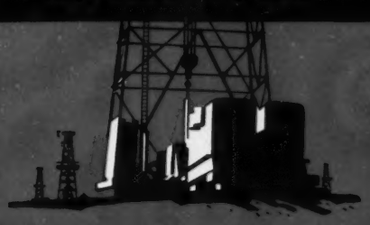
More than 90% of all the long-line, franchise-operated, heavy-duty, diesel-driven trucks now operating in the 11 Western States are Cummins-powered.

Any list of the nation's major contractors is a list of Cummins Diesel owners. Their records prove that . . . "powered by Cummins is powered for profit."

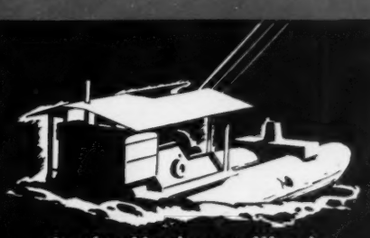
On the rich Mesabi Iron Range, more than 80% of the rubber-tired earth and ore moving equipment is powered by Cummins Dependable Diesels.



Service facilities at some 40 salt water and fresh water ports . . . one more reason why so many commercial and pleasure craft are Cummins-powered.



In the vast Mid-Continent Area—the world's greatest oil producing region—Cummins Dependable Diesels power more drilling rigs than any other diesel.



In the Northwest Woods, no single make of diesel engine powers as many yarders, loaders and heavy-duty trucks as Cummins Dependable Diesels.

Some 130 leading builders of powered equipment now offer Cummins Diesels as standard or optional original power . . . *proof of proved performance!*

CUMMINS *Dependable* DIESELS

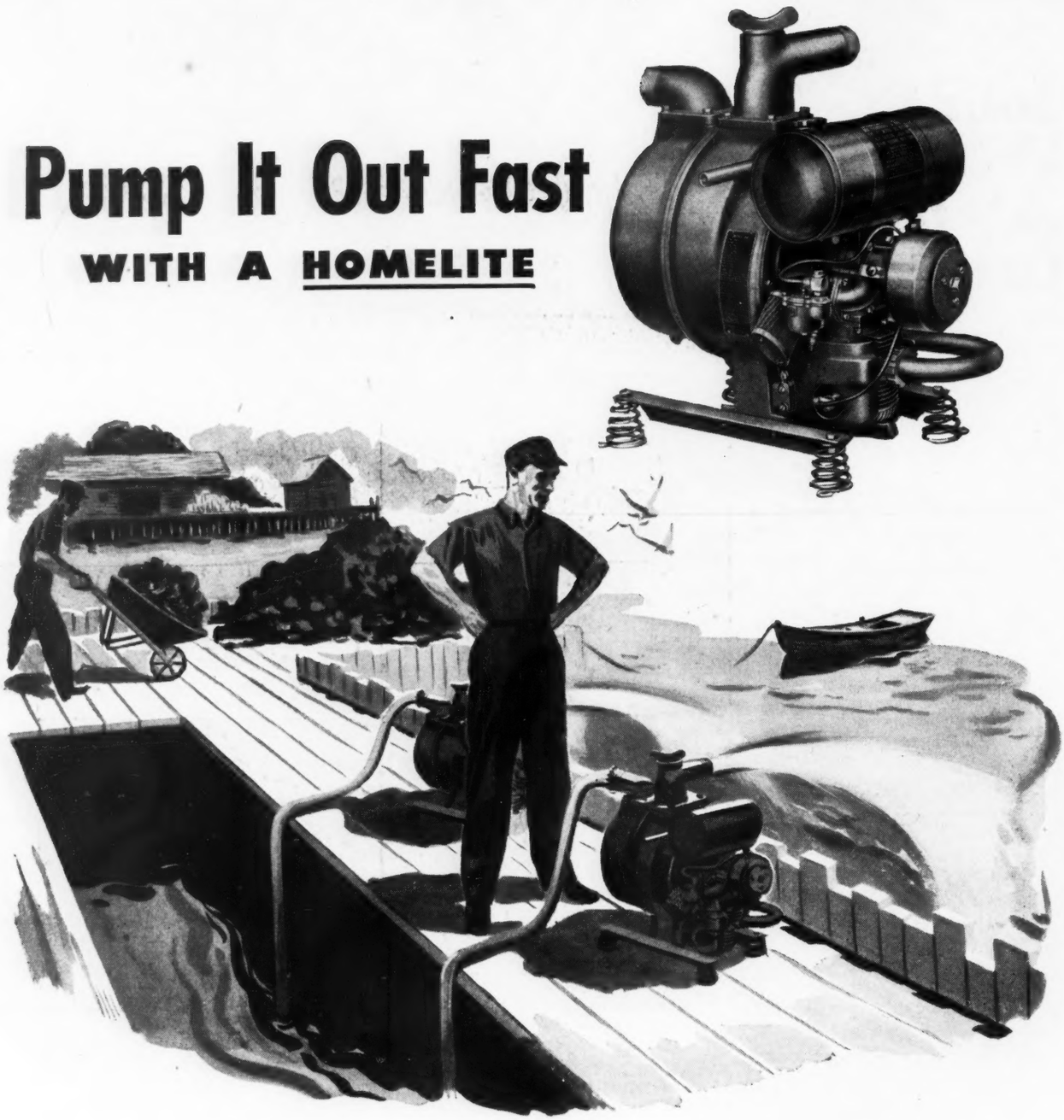
SINCE 1918...PIONEER OF PROFITABLE POWER THROUGH HIGH SPEED DIESELS

For every heavy-duty power application—automotive, portable, stationary and marine—a proved-on-the-job Cummins Dependable Diesel . . . 50 to 275 hp.

CUMMINS ENGINE CO., INC.
Columbus, Indiana

Pump It Out Fast

WITH A HOMELITE



When you have a lot of pumping to do, get your Homelite Portable Pumps on the job. They'll gush it out at 15,000 gallons per hour. They'll suck it up 28 feet. And they'll keep seepage under control . . . always at strainer level.

Homelite gasoline-engine-driven pumps are small enough for a man to carry (they weigh only 88 pounds), but big enough for heavy-duty pumping. Moreover, due to the extreme simplicity of the design of these pumps and the special materials that we have put into them, they'll work longer and with less trouble and maintenance. Send for complete information.

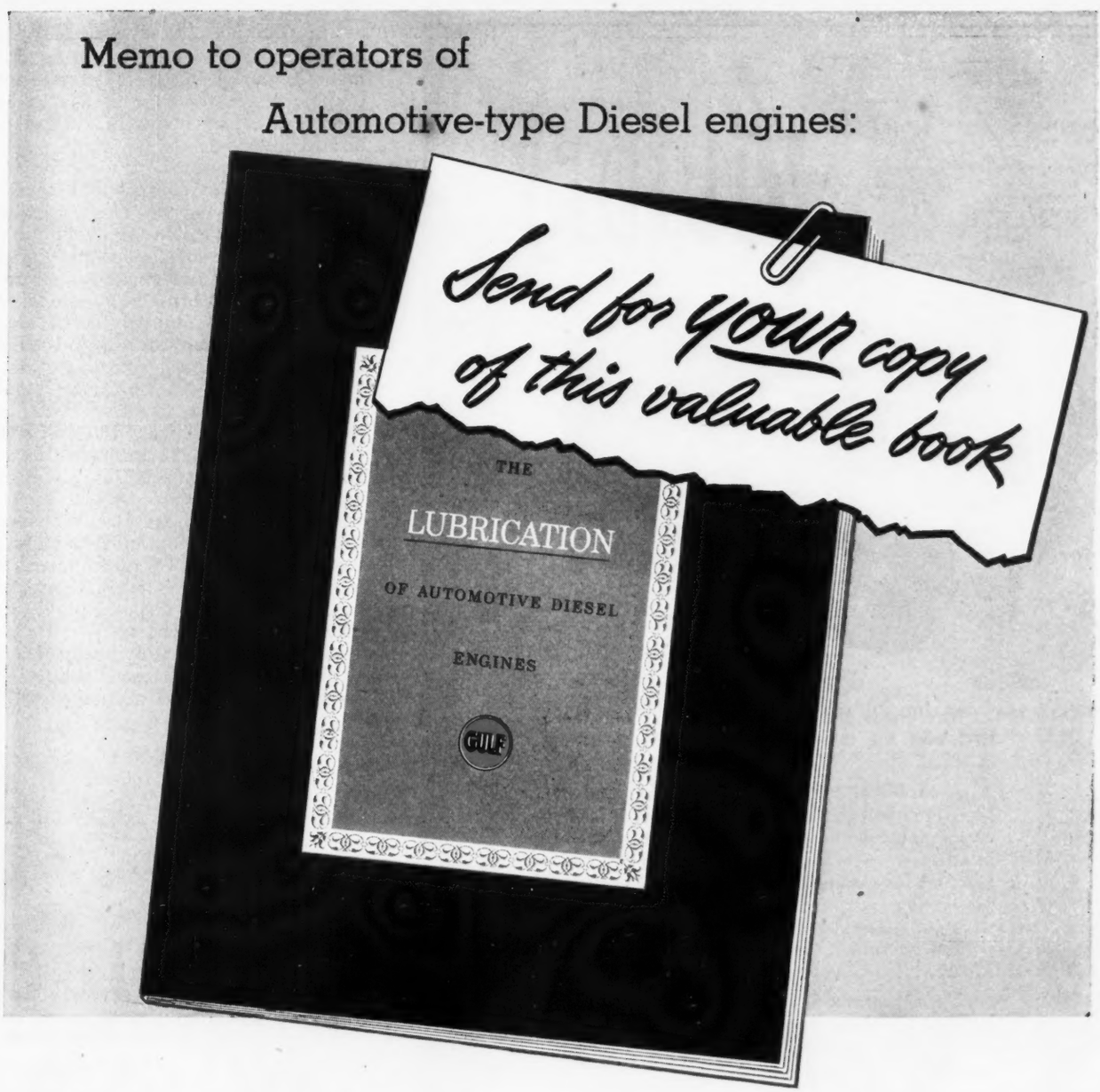
Homelite Corporation

Portable PUMPS · GENERATORS · BLOWERS

PORT CHESTER, NEW YORK

Memo to operators of

Automotive-type Diesel engines:



48 pages of useful information!

READ the new Gulf book "The Lubrication of Automotive Diesel Engines"! Here are some of the important subjects covered in this instructive book: Selection and care of lubricating oil, functions of the lubricating oil, engine tests, Diesel fuels and their combustion—and many others.

It tells how to break in new rings faster, when to replace pistons, the nature of light-load and low-temperature engine troubles, and answers many other important operating questions.

To get your copy of this useful book, just fill in the attached coupon and mail it to the address shown below.

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Mail this coupon today!

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Please send me, without obligation, a copy of the new Gulf Book, "The "Lubrication of Automotive Diesel Engines."

Name.....

Company.....

Title.....

Address.....

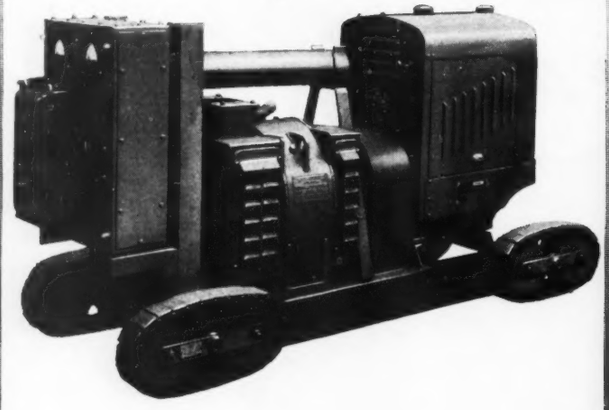
(Continued from page 142)

ings are spark-proofed by either of two methods shown in accompanying photographs, the method for each area being chosen in accordance with the degree of hazard involved.

Some conception of the extent of the project and the construction work involved may be derived from a summary of the facilities called for under the contract: two large-caliber loading lines—24 main buildings; two small-caliber rocket loading lines—24 main buildings; TNT filling line—39 buildings; inert storage—38 buildings; explosive storage magazines—215 buildings; administration and industrial area—40 buildings; housing development—262 dwelling units; railroad, 115 mi.; highway, 100 mi.; streets, 4 mi.; sidewalks, 25 mi.; parking area, 230,000 sq. yd.; water mains, 110 mi., water wells, 6; elevated water tanks, 4; water treatment plant, 1; main electric substation, 1; distribution substations, 91; transmission line, 75 mi.; underground power lines, 20 mi.; sewers, 35 mi.; manholes, 410; sewage disposal plant, 1; incinerator, 1; telephone system; fire alarm system; gas main, 18; overhead insulated steam mains, 8 mi.; street lighting, 4 mi.; highway lighting, 60 mi.; new drainage

(Continued on page 150)

designed for Victory



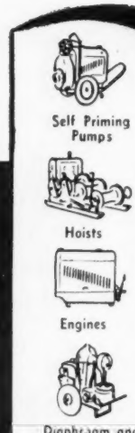
Mobility is the key to Victory! "Get there first with the most!" applies in 1945 as it did in 1865!

Auto Diesels, Ltd. of Uxbridge, England designed the unit in the above illustration. It insures complete mobility over difficult terrain by mounting the Generator Set on four miniature caterpillar treads. These miniature treads proved as efficient for moving Generator Sets as the larger models were for giant Tanks! For quick starting and positive operation, they powered the unit with the famous Novo CW Gasoline Engine!

This Generator Set was designed for VICTORY because it was designed for MOBILITY . . . it was powered for VICTORY because it was powered by NOVO.

Novo gasoline engines range from 4 to 22 h.p., in 1, 2 and 4 cylinder models. For complete information, contact your Novo Distributor, or write to the factory.

Allied Member of A.E.D.



NOVO ENGINE CO.

LANSING 5, MICHIGAN

National Carbide FLOODLIGHTS

FOR ALL PURPOSES WHERE FLOOD-LIGHTS ARE REQUIRED

Simple in Construction
Economical in Cost
Dependable in Operation

Available in 1500, 8,000 and 16,000 candlepower units.

National Carbide N-200 Light illustrated. Write for literature showing entire line of Floodlights and Lanterns

NATIONAL CARBIDE CORP.
60 E. 42nd St. New York 17, N. Y.

WHERE TOUGHEST SERVICE HITS TIRES HARDEST

General's EXTRA QUALITY stands out!

GENERAL DEEP CLEAT

GENERAL EARTH MOVER

The General Rock Special is designed to give maximum efficiency . . . and lowest tire costs . . . on rocky ground hauling.

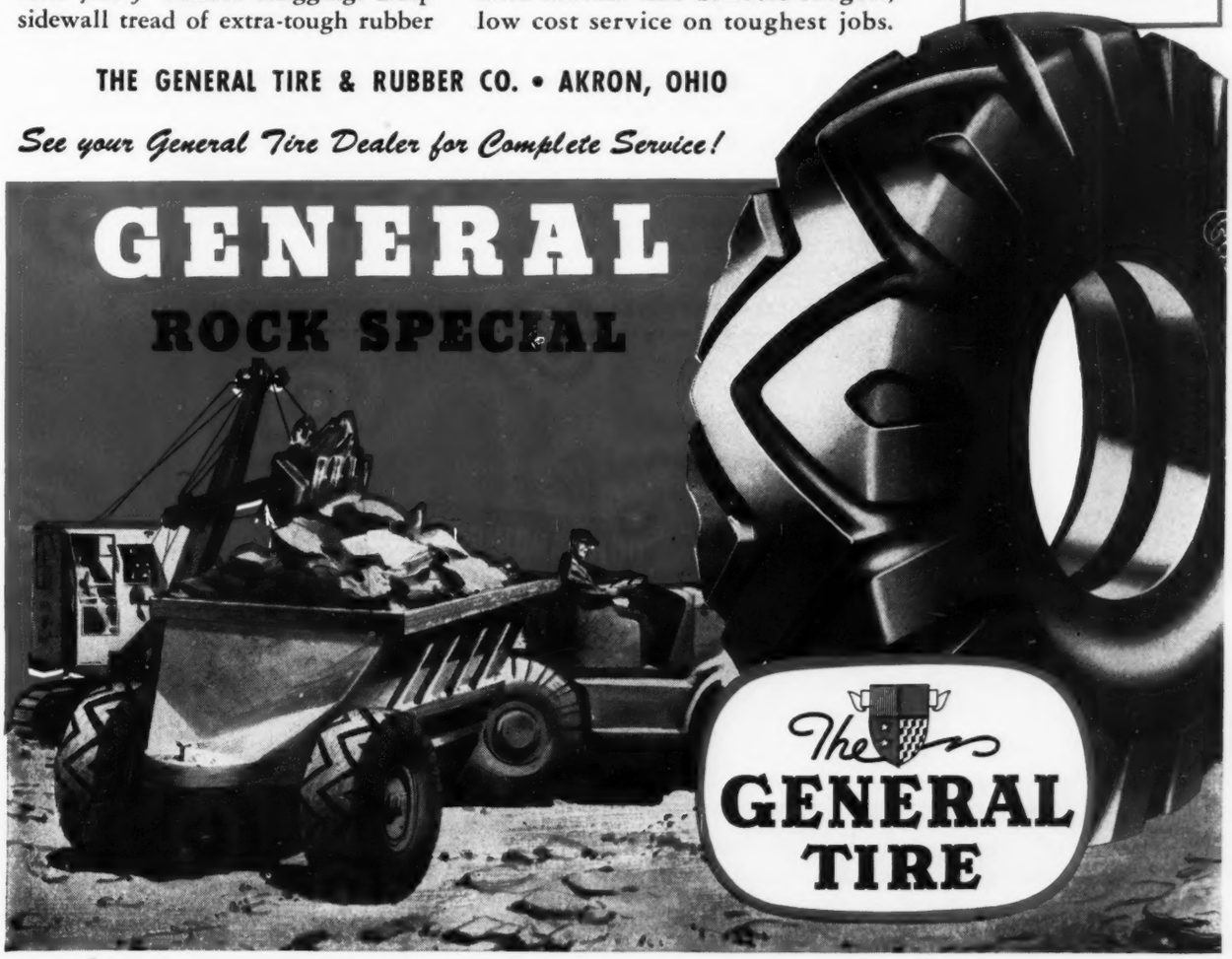
The broad, flat tread design puts more tread to work for peak load capacity and stability . . . gives positive traction on roughest ground and all-directional skid protection . . . yet *rolls freely* without snagging. Deep sidewall tread of extra-tough rubber armors against cuts, tears and abrasion.

A special ply-bonded "cushion" construction *absorbs* shock stress evenly throughout the tire . . . minimizes the effects of abuse.

The same Top-Quality that has made Generals America's long-mileage favorites for 30 years . . . gives the General Rock Special the kind of *extra-stamina* that delivers longest, low cost service on toughest jobs.

THE GENERAL TIRE & RUBBER CO. • AKRON, OHIO

See your General Tire Dealer for Complete Service!



PROFIT MAKERS!

GAR WOOD ROAD MACHINERY
WITH ALLIS-CHALMERS DIESEL POWER

Whether it's the fast, high capacity Gar Wood Cable Scraper shown above or any other unit in the complete line of Gar Wood Road Machinery, you can be sure it is a consistent profit maker.

The profit earning ability of Gar Wood equipment has been proved by the best of all tests—actual on-the-job performance. In fact, such performance tests are the basis for a very large proportion of Gar Wood orders. For these orders are *repeat* orders from fleet users whose cost sheets show that Gar Wood Road Machinery cuts earth moving costs to a minimum—makes possible maximum profits on job after job.

Get your share of profits in the big construction program that's just ahead. Order Gar Wood Road Machinery now from your Allis-Chalmers dealer.

SPECIFY GAR WOOD FOR OUTSTANDING PERFORMANCE

Heavy Duty Rippers | Cable Dozecasters | 2-Wheel Hydraulic Scrapers | 4-Wheel Hydraulic Scrapers | Hydraulic Bulldozers

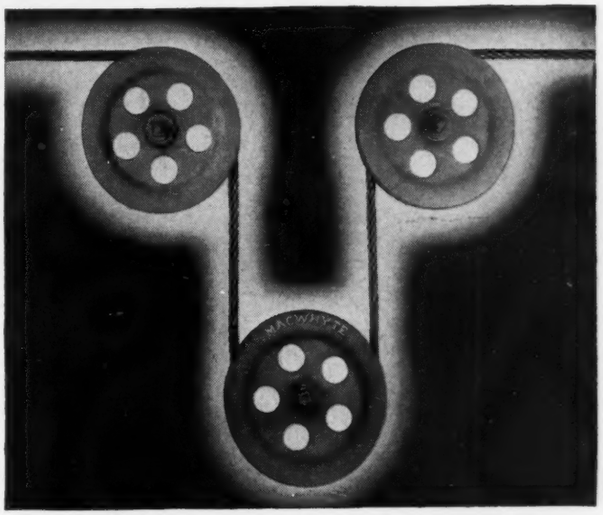
GW ROAD MACHINERY is Sold Through ALLIS-CHALMERS Dealers Everywhere

ROAD MACHINERY DIVISION
GAR WOOD INDUSTRIES, Inc.
DETROIT 11, MICHIGAN

OTHER PRODUCTS OF GAR WOOD INDUSTRIES INCLUDE HOISTS AND BODIES • WINCHES AND CRANES • TANKS • HEATING EQUIPMENT • MOTOR BOATS

Recommended for these extra-tough jobs!

MACWHYTE PREformed WIRE ROPE



Macwhyte PREformed Wire Rope gives excellent service on the following installations:

EXCAVATING:

Load Lines on all types of portable excavating machinery such as:
Shovels
Clamshell Cranes
Pull Stroke Shovels
Draglines
Backfillers
Pile Drivers
Scrapers—Scraper Loaders

MINING:

Hoist, Slope, or Incline Ropes
Mining machine ropes
Non-spinning ropes for shaft sinking and shaft hoists

DRILLING:

Rotary oil well drilling lines

QUARRYING:

Derrick Main Falls
Whip Ropes
Slings

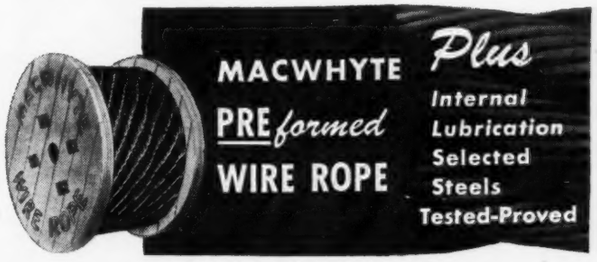
LOGGING:

Choker Ropes
Haulback Lines
Main Lines
Skidding Lines
Receding Lines
Loading Lines

GENERAL:

All Lang Lay Ropes
All 18 x 7 Kilindo Non-rotating Ropes
Elevator Ropes
Industrial Ropes

Send for booklet 43-85 "Wire Rope Conservation Bulletins" illustrating and describing many factors affecting wire rope service.



The correct rope for your equipment

Twenty years of service has proved that because it is more flexible, Macwhyte PREformed Wire Rope gives superior service on equipment requiring a great amount of bending over sheaves, particularly at high speeds. Macwhyte PREformed also stands up better under heavy loading and continuous operation.

Because it lasts longer, Macwhyte PREformed costs less in the long run.

HERE'S WHY Macwhyte PREformed lasts longer. Each wire and strand is PREformed to the exact helical shape it assumes in the finished rope. This reduces internal stresses, greatly increases flexibility.

Keep asking for MACWHYTE PREformed!

The demands of our armed services are so great now, there may be times when we cannot give you our usual prompt service and delivery. The situation changes from day to day, so please keep sending us your inquiries.

MACWHYTE COMPANY

Wire Rope Manufacturers

ARMY E NAVY

NO. 804

2941 FOURTEENTH AVENUE KENOSHA, WISCONSIN

Mill Depots: New York • Pittsburgh • Chicago • Fort Worth • Portland • Seattle • San Francisco. Distributors throughout the U.S.A.

MACWHYTE PREformed and Internally Lubricated Wire Rope
MONARCH WHYTE STRAND Wire Rope
MACWHYTE Special Traction Elevator Rope
MACWHYTE Braided Wire Rope Slings
MACWHYTE Aircraft Cables and Tie-Rods
MACWHYTE Stainless Steel Wire Rope
MACWHYTE Monel Metal Wire Rope

(Continued from page 146)

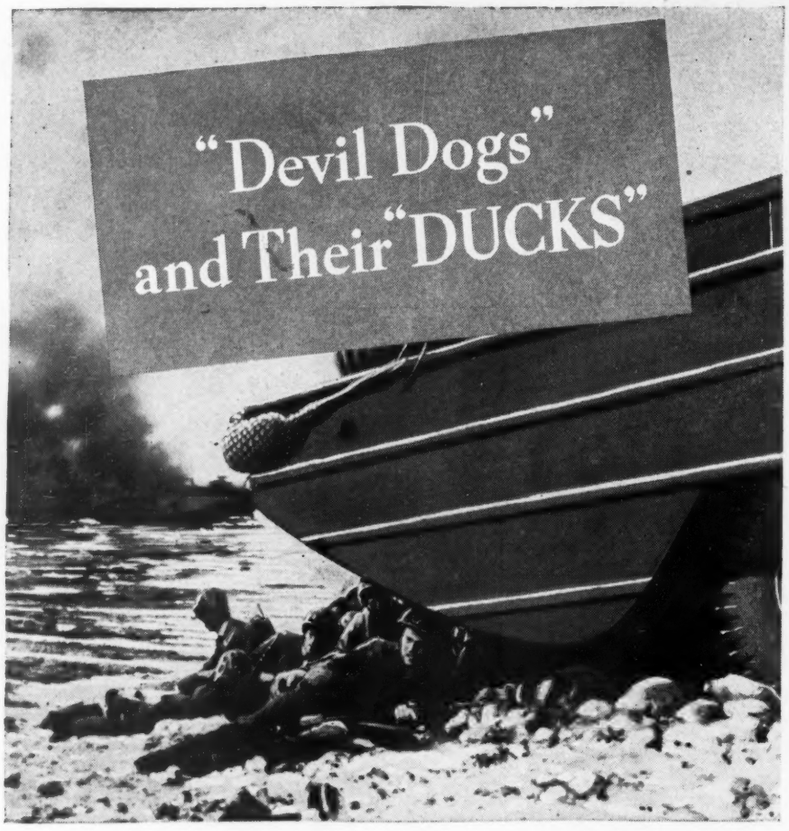
channels, 25 mi.; clearing and grubbing, 10,000 acres.

To construct these facilities, the contractors placed orders for large quantities of materials and made arrangements with subcontractors to supply other materials. Among the materials estimated and placed on order for the job were the following: concrete, 330,000 cu. yd.; structural steel, 13,000 tons; common brick, 4,000,000; smooth-face tile, various sizes, 1,500,000; 15-lb. felt, rag and asbestos, 15,000 rolls; 30-lb. tar saturated rag felt, 5,000 rolls, coaltar pitch, 1,481 tons, roofing asphalt, 600 tons: primer asphalt and creosote, 75,000 gal.; roof gravel, 750 tons; precast concrete roof channels, 525,000 sq. ft.; glass blocks, 150,000; glass block wall ties, 15,000 lin. ft.; glass block expansion joint, 15,000 lin. ft.

It is obvious that the foregoing list omits many materials of which huge quantities were used, such as corrugated asbestos-cement sheets and window glass. However, the list does indicate the large volume of construction material which had to be assembled and combined into the permanent structures of this project.

In addition to the Fraser-Brace contract, a separate architectural contract

(Continued on page 152)



At Peleliu, Marines of the famed First Division "hit the beach" behind a GMC "Duck." Official U. S. Marine Corps Photo

GMC started to produce "Ducks" at about the same time that the Marines started to "jump all over the Japs" in the Pacific. Since then, the Navy's amphibious fighters have used GMC's amphibious trucks in a score of successful assaults from Guadalcanal to Guam.

At Arawe and Cape Gloucester, invasion beaches were blasted by a blazing barrage fired from "Ducks" equipped with rocket guns. At Saipan and Tinian, Leathernecks used many of these "landing boats on wheels" to help stage the surprise attack that put big B-29s within bombing distance of Japan. At Iwo Jima and Okinawa, the Marines were supported by GMC "Ducks" through some of their fiercest Pacific fighting.

The "Duck" made an ideal transport vehicle for island hopping "Devil Dogs" because, boat and truck combined, it followed the fighting through sea, surf, coral sand and jungle swamp.

In addition to being one of the largest producers of military vehicles, over 575,000, GMC is building many commercial trucks for essential users. Civilian GMCs are powered by engines of the same basic design as the famous "270," used in the GMC "six-by-six" . . . the "Workhorse of the Army."

INVEST IN VICTORY . . .
BUY VICTORY BONDS

GMC TRUCK & COACH DIVISION
GENERAL MOTORS

HOME OF COMMERCIAL GMC TRUCKS AND GM COACHES
VOLUME PRODUCER OF GMC ARMY TRUCKS AND AMPHIBIAN "DUCKS"

CUT SHORING COSTS 40% WITH

RJM
TRUSSES & TEE POSTS
FOR CONCRETE FORMS

FEATURES:
- No Tie-Rods or Wires!
- Cut Lumber Waste 75%!
- Sturdy-handle Any Form!
- For All Architectural Designs!
- Field-Tested and Approved!
- Heavy Steel—Arc Welded!

FOR SALE OR LEASE
Available as materials are released
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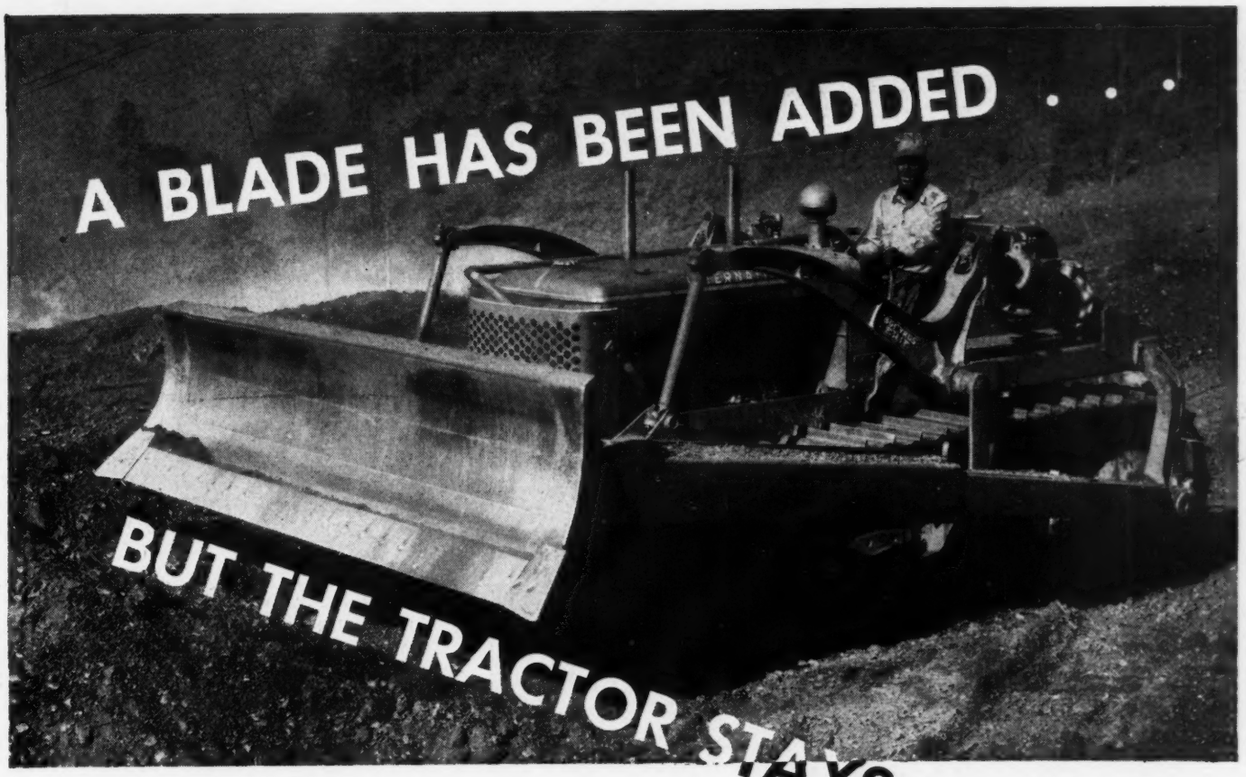
RAY J. MOTHS CO., Inc.
Gen. Offices: 714 W. Wisconsin Ave.
Milwaukee 3, Wisconsin



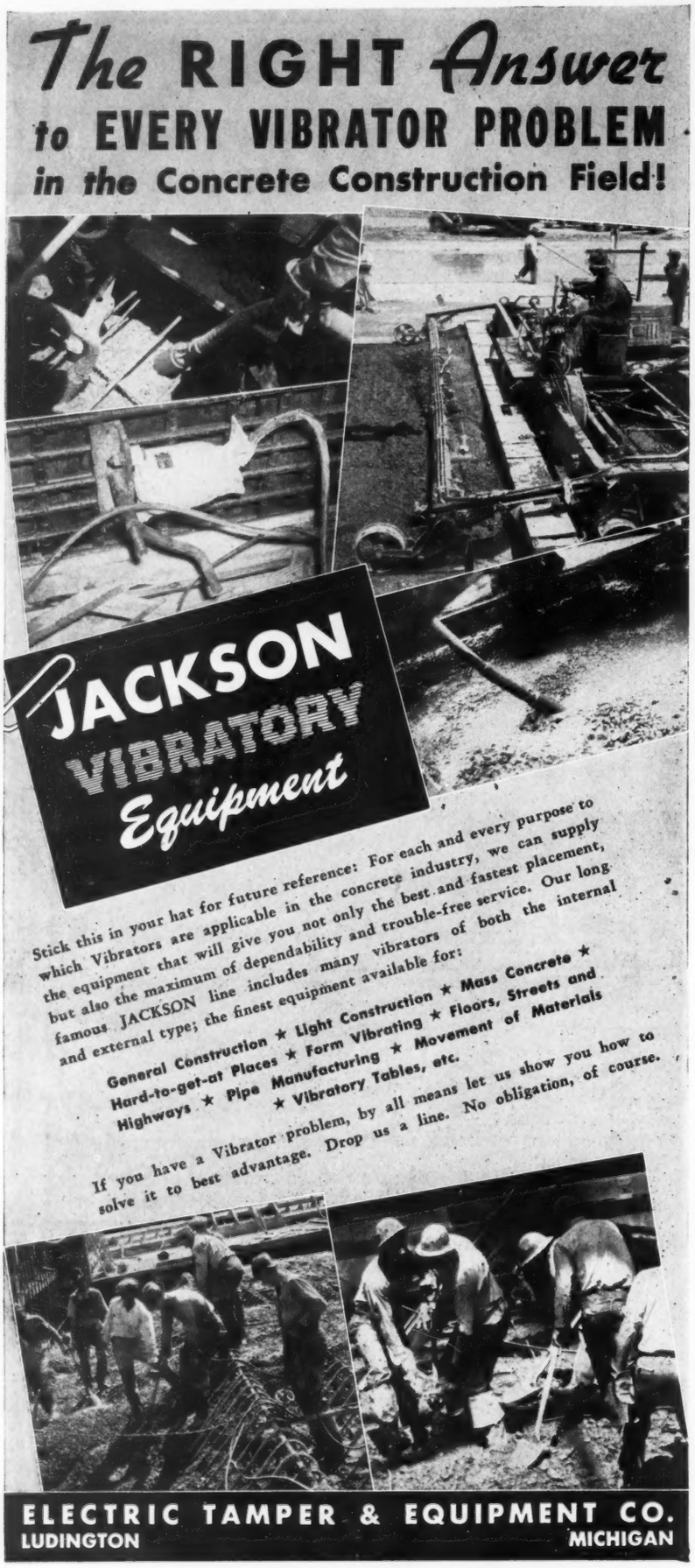
When a Bucyrus-Erie Bullgrader is mounted on an International TracTracTor, the all-important center of gravity does not change appreciably. There is no radical "balance-upset" to cause loss of power, excessive wear, or loss of the efficiency originally built into the tractor. Weight is properly distributed to give you full advantage of tractor power. Maintenance is low because digging loads are applied at the places designed to take them. All the speed, stability, and maneuverability of the bare tractor are still yours .... No wonder a Bucyrus-Erie Bullgrader in action is a picture of smooth efficiency. The operator can handle it easily without nosing down, gouging, jerking, or stalling. It digs its blade in and sweeps through the cut with the fast action that turns out accurate grades and record outputs. Drive is smooth, easy on the tractor. The whole length of the

tracks bears on the ground at all times for full tractive effort. Maximum power is concentrated at the blade . . . Performance like that will economically solve plenty of dirt-moving problems for you. That's why it will pay you to get complete information on Bucyrus-Erie Bullgraders from your International TracTracTor Distributor.

BUCYRUS ERIE

SOUTH MILWAUKEE, WISCONSIN

SEE YOUR INTERNATIONAL TRACTRACTOR DISTRIBUTOR


The RIGHT Answer
to EVERY VIBRATOR PROBLEM
in the Concrete Construction Field!
JACKSON
VIBRATORY
Equipment
Stick this in your hat for future reference: For each and every purpose to which Vibrators are applicable in the concrete industry, we can supply the equipment that will give you not only the best and fastest placement, but also the maximum of dependability and trouble-free service. Our long famous JACKSON line includes many vibrators of both the internal and external type; the finest equipment available for:
General Construction ★ Light Construction ★ Mass Concrete ★ Hard-to-get-at Places ★ Form Vibrating ★ Floors, Streets and Highways ★ Pipe Manufacturing ★ Movement of Materials ★ Vibratory Tables, etc.
If you have a Vibrator problem, by all means let us show you how to solve it to best advantage. Drop us a line. No obligation, of course.
ELECTRIC TAMPER & EQUIPMENT CO.
LUDINGTON
MICHIGAN

(Continued from page 150)

was let by the Navy to Graham, Anderson, Probst & White, Chicago, for design of the buildings in the administration and industrial area. This firm maintained offices at the site, but produced most of the final design drawings in its Chicago offices.

Under the principal construction contractors (the WHMS group) cost-plus-fixed-fee subcontracts were negotiated for certain phases of the job. The George A. Fuller Co., Chicago and New York, took a subcontract, the first in the firm's history, to construct buildings in the administration and industrial area; this work was estimated to cost about $4,422,000. Other fixed-fee subcontractors were as follows: M. J. Boyle & Co., Chicago, transit-mix concrete, about 330,000 cu. yd.; Fischbach & Moore of Texas, Inc., Dallas, electrical work, about $7,360,000; Fleisher Engineering & Construction Co., Minneapolis, permanent housing, about $1,300,000; Associated Mechanical Contractors, Dallas, Tex., sewer, water and gas lines, about $16,568,000.

In addition, the general contractor awarded lump-sum subcontracts for various items to about thirty firms. The largest of these, valued at $2,416,000, was to Bowen & McLaughlin, Phoenix, Ariz., for clearing and grubbing. Other firms on clearing and grubbing were Taylor & Wheless, Hattiesburg, Miss., about $1,400,000, and Taylor Construction Co., Taylor, Tex., $540,000. Land cleared and grubbed totaled about 10,000 acres. Under another subcontract, Kiewit-Amis-Cunningham, Omaha, Neb., graded for roads and railroads to the amount of $1,190,000.

Construction Equipment

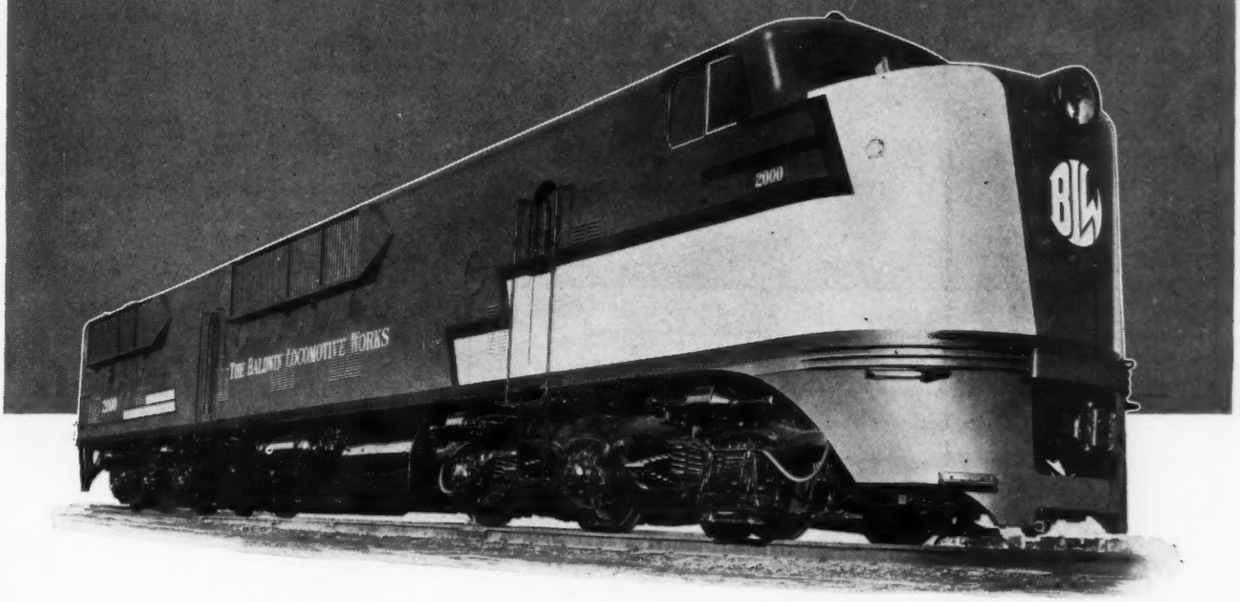
For required progress, a great mass of construction equipment had to be assembled on the job. The contractors and the Navy scoured the country to rent or buy the necessary machines. Equipment in use by the fixed-fee contractors totaled 4,300 pieces, of which 1,650 were automotive units, including 248 truck mixers. Maintenance and repair of the vast assemblage of equipment required a large, competent staff and several well-equipped shops. Without this skilled maintenance of its war-worn construction plant, the project could not have kept going. A later article will describe the equipment maintenance in more detail.

Concrete

An accompanying photograph shows the project's first central batching plant, equipped with two 3-yd. tilting mixers, where truck-mixer batches were pre-

(Continued on page 154)

Headed for a long, long run



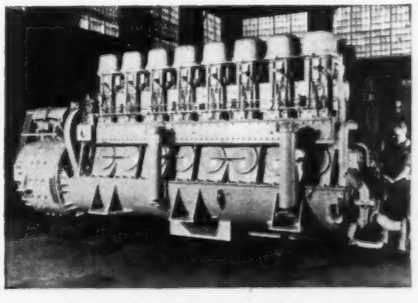
In their first Main Line Diesel, the Baldwin Locomotive Works have incorporated their long and successful experience in building rugged, sturdy switchers powered by Baldwin-built Diesel engines.

The longer life and lower maintenance costs obtained on the first liners Baldwin had processed with PORUS-KROME led them to standardize on this type of liner . . . and now every Baldwin Diesel engine coming off the production line has the greater reliability assured by PORUS-KROME. Of course, their first Main Line Diesel has PORUS-KROME applied to its liners, too, and thus it is headed for a long, long run of reliable operation.

PORUS-KROME is hard, pure chromium applied by the patented Van der Horst process. It has tiny pores and channels which serve as reservoirs for lubricating oil, feeding it back as needed. It greatly decreases the wear on bearing surfaces, and, when applied to cylinder walls, it multiplies their life 4 to 20 times . . . and the life of conventional rings 3 to 5 times.

In addition to providing a "long life" cylinder wall surface, PORUS-KROME has many diversified applications. If you have troublesome wear problems on any parts of your machines or equipment, or are seeking a way to give your customers an added value in your products, Van der Horst engineers may be able to supply the solution for you. Write today telling us just what your problems are . . . no obligation, of course.

Van der Horst Corporation of America, Olean, N. Y.
Plants in Olean and in Cleveland, Ohio



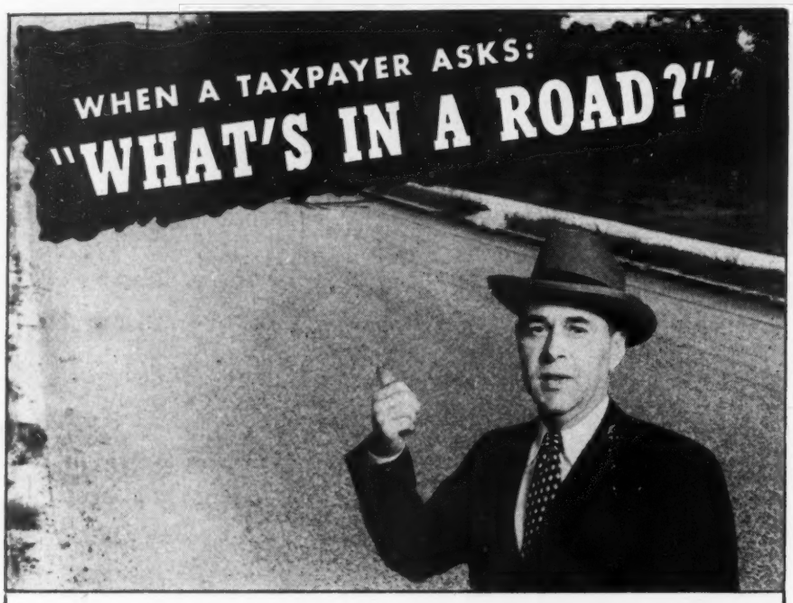
Two of these 1000 hp. Baldwin Diesel-Westinghouse generator units make up the power plant of the Baldwin Main Line Diesel. Cylinder liners are PORUS-KROME processed.

PORUS - KROME

Good for the Life of your Engines

VAN DER HORST

AN AFFILIATE OF DRESSER INDUSTRIES



Today's taxpayer is taking a keen interest in roads and road-making. He is asking for better roads, smoother riding for his not-too-young automobile. And, as always, he is vitally concerned with lowered costs and economy.

KOTAL Master Mixes have proved a revolutionary development in attaining better roads at lower costs.

The Performance Record

of KOTAL Master Mixes has been demonstrated in five years' usage on the nation's roads . . . aiding the engineer with an all-weather, easy-to-use mixing material that helps to achieve tough, long-wearing roads.

The Cost Records

of KOTAL Master Mixes reveal that time and labor are saved, many new economies are being realized.

You will find unusually interesting the booklet which presents the detailed "inside story" of KOTAL Master Mixes. Write for your copy. The name of your nearest supplier will also be sent.

EASY TO USE. Quickly mixed, ready to lay. No preheating or drying.

STABILITY. Cure quickly and permanently. Do not shift, ravel or pick up. Open sooner to traffic.

WORKABILITY. Do not adhere to equipment. Work easily.

LONG-TERM STOCK PILES. Can be stock-piled for many months without losing workability.

SAVE TIME. Quickly made stock piles ready for immediate use without frequent fresh mixes.

SAVE LABOR. Actual road records prove fewer labor hours required.

SAVE MONEY. Savings in time and labor mean economies in road costs.

EXTEND PAVING SEASON. All-weather workability permits more months of operation.

MASTER MIXES KOTAL **KOTAL COMPANY ★ 52 Vanderbilt Ave. ★ New York 17**

KOTAL *Master Mixes*

The Advanced All-Weather Aid in Building Better Roads

(Continued from page 152)

shrunk before being charged into the drums for mixing en route to the point of concrete placement. Later, another batching plant with two 2-yd. mixers was added near the center of the reservation to reduce concrete hauling distances. From the original plant, set up on a railroad siding at one edge of the 72,000-acre site, the haul to storage magazines at the diagonally opposite corner was 16 mi.

Truck mixers ranged in size from 2 to 6 yd. The concrete was the E1 mix of the Bureau of Yards and Docks, equivalent to 1:2.23:3.21, with 488.8 lb. of cement per cu. yd. Water was set at 7.0 gal. per sack in an attempt to maintain a slump of 7½ in. at the batching plant and 2½ to 4 in. at the point of delivery. No water was added by the truck mixer. To avoid difficulties, the delivery time was restricted to 1 hr. Additional in- was restricted to 1 hr.

Plywood forms and methods of concrete distribution, by hand carts from floor hoppers and by crane and bucket, are indicated by photographs. Formwork on the project is estimated to have required about 1,500,000 sq. ft. of plycrete grade plywood.

Steel Erection

Use of Dardelet rivet bolts in place of hot rivets for a large part of the steel erection was said by some of the engineers on the job to have effected a saving on labor. The rivet bolts were used to speed the work when skilled riveting crews could not be obtained quickly.

Management

For the Bureau of Yards and Docks of the Navy Department, the Naval Ordnance Plant at Shumaker, Ark., has been constructed under the direction of the following offiers: Comdr. Joseph White, officer in charge of construction; Comdr. Viggo C. Bertelsen, assistant officer in charge of construction and administrative superintendent; Comdr. C. E. Spellman, contract superintendent; Lt. Comdr. Martin P. Callan, design superinendent; Lt. Comdr. J. Henry Etter, Jr., procurement superintendent.

Operations of the WHMS group (Winston Bros. Co., C. F. Haglin & Sons, Inc., Missouri Valley Bridge & Iron Co., Sollitt Construction Co.) are under the supervision of A. A. Fuller, contractors' representative, and Ray V. Johnson, general manager. For the engineering and architectural contractors, C. A. Holden, chief engineer, is in charge for the Fraser-Brace Engineering Co., Inc., and T. Clifford Noonan, resident engineer, represents Graham, Anderson, Probst & White.

QUALITY EQUIPMENT

ANCHOR WINCHES
BAND FRICTION HOISTS
BARGE DERRICKS
BARGE HOISTING MACHINERY
BELT HOISTS
BLOCKS
BOOM HOISTS
BOOM SWINGING ATTACHMENTS
BUCKET HOLDING DRUMS
BUILDERS HOISTS
BUILDERS TOWERS
CABLEWAYS
CANE HANDLING EQUIPMENT
CAPSTANS
CAR PULLERS
CRANES -- WHIRLEY TYPE DERRICKS
DERRICK FITTINGS
DIESEL HOISTS
DOCK WHEELS
DRAG SCRAPER HOISTS
DREDGE HOISTS
ELECTRIC HOISTS
ELEVATOR TOWERS
ERECTORS GUY DERRICKS
GASOLINE HOISTS
GUY DERRICKS -- STEEL
GUY DERRICKS -- TIMBER
HAND POWERS
HIGH SPEED HOISTS
HOD HOISTS
HOOKS and SHACKLES
HORIZONTAL ENGINES
HORSEPOWERS
INDEPENDENT SWINGERS
LIGHTERAGE DERRICKS
LIGHTERAGE HOISTS
LOG LOADERS
LOCOMOTIVE CRANES
MATERIAL ELEVATORS
MINE HOISTS
MOORING WINCHES
PILE DRIVING EQUIPMENT
RAILROAD ERECTORS
ENGINES
SHAFT HOISTS
SHEAVES
SKELTON ENGINES
SKIDDERS
SLOPE HOISTS
STIFF-LEG DERRICKS -- STEEL
STIFF-LEG DERRICKS -- TIMBER
SNATCH BLOCKS
SUCTION DREDGE HOISTS
TIMBER BARGE FITTINGS
TIMBER DERRICKS
TOW HAULAGE HOISTS
TRACK LAYERS
TRAVELING DERRICKS
UTILITY DERRICKS
UTILITY HOISTS
WARPING WINCHES
WHIRLEYS
WINCH ENGINES
WINDLASSES
WIRE ROPE BLOCKS
WIRE ROPE SHEAVES
YARDERS

Order Now For Early Delivery

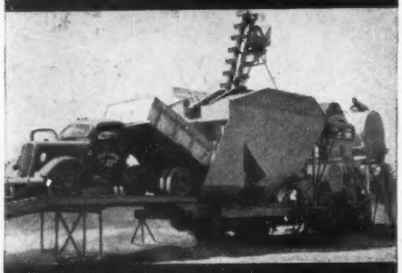
CLYDE

CLYDE IRON WORKS, Inc.
Duluth 1, Minnesota

JOHNSON

Porto-Batcher

SAVES A LOT of TIME and MONEY



Quickly Set Up for Operation at the Most Advantageous Location

The Johnson Porto-Batcher is a complete highway portable batching plant. Its use permits these substantial time and money savings:

1. The Johnson Porto-Batcher can be towed behind a truck to the most advantageous point in the pouring area. **2.** Since the Porto-Batcher is quickly set up for operation, long hauls of mixed concrete are eliminated . . . the number of mixing units is reduced and the number of concrete yard miles lessened. Control of all operations is centralized. **3.** All materials are delivered to the batching unit in bulk material trucks . . . eliminating extra handling equipment. **4.** The Johnson patented charging skip permits full utilization of mixer capacity. By providing proper intermingling of aggregates with cement when discharged into mixer, it assures pre-mixing and pre-shrinkage . . . prevents cement from touching wet mixer opening and walls thus eliminates gumming and excessive wear. **5.** All levers are grouped in one central location to permit control of operations by one man. Write for bulletin.

Write for data on Ready Mix Plant • Bulk Cement Handling Equipment • Cement Storage Bins • Concrete Buckets • Batchers

The C. S. Johnson Company
Champaign, Illinois

Superfortress Bases

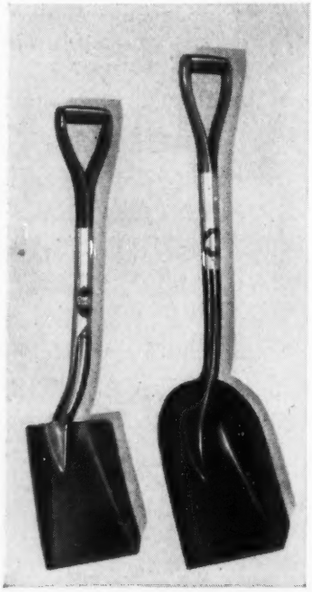
(Continued from page 95)

the old 3,900-ft. Japanese fighter strip. Within 24 hr. this crew had the runway ready for a safe landing by the first U. S. Thunderbolt; 2 hr. later, other fighters had landed and taken off on the first Saipan-based mission.

To speed the work, men of the Aviation Engineers went on two 12-hr.-a-day, 7-day-a-week shifts; work continued all night under the glare of floodlights and headlights. Machinery went on a round-the-clock schedule; repairmen worked right on the line inspecting the equipment, trying to replace worn parts before they gave way, and often making major repairs without deadlining the machines. Seldom has modern construction machinery taken such a day-in and day-out beating—but somehow the maintenance men managed to keep it going.

Grading of the airfield was the biggest

(Continued on page 158)



BLADE EDGES
GUARANTEED SPLIT-PROOF

INGERSOLL SHOVELS
"The Borg-Warner Line"

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INGERSOLL STEEL & DISC DIVISION
BORG-WARNER CORPORATION
New Castle, Indiana
Plants: New Castle, Ind.; Chicago, Ill.; Kalamazoo, Mich.

Look for the Arm-and-Hammer
ARMSTRONG BROS.
BETTER PIPE TOOLS

Threads of Lathe-cut Smoothness

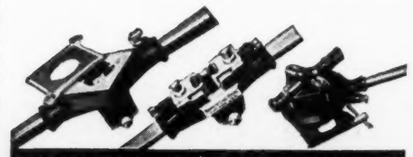
Machined from special oil-tempered Chrome-Vanadium Tool Steel, with hob-cut teeth "backed-off" from their ground cutting points; with accurately figured cutting angles and chaser rakes and ample chip clearance, these finer dies produce threads of lathe cut smoothness. They cut freely, faster, without drag and spin off the pipe without tearing or jamming.

Hardened, drawn, tempered and tested, they hold their keenness and free-cutting qualities.

They fit all standard made Stocks or Threaders—"Adjustable," "Receding" or "Solid"—come in all pipe sizes from 1/4" to 2".

ARMSTRONG BROS. Stock and Receding Threaders are improved in design, accurately balanced and machined inside and out.

Write for Catalog



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"The Tool Holder People"
334 N. FRANCISCO AVE. • CHICAGO, U.S.A.

Eastern Sales Office: 199 Lafayette St., N. Y. 12
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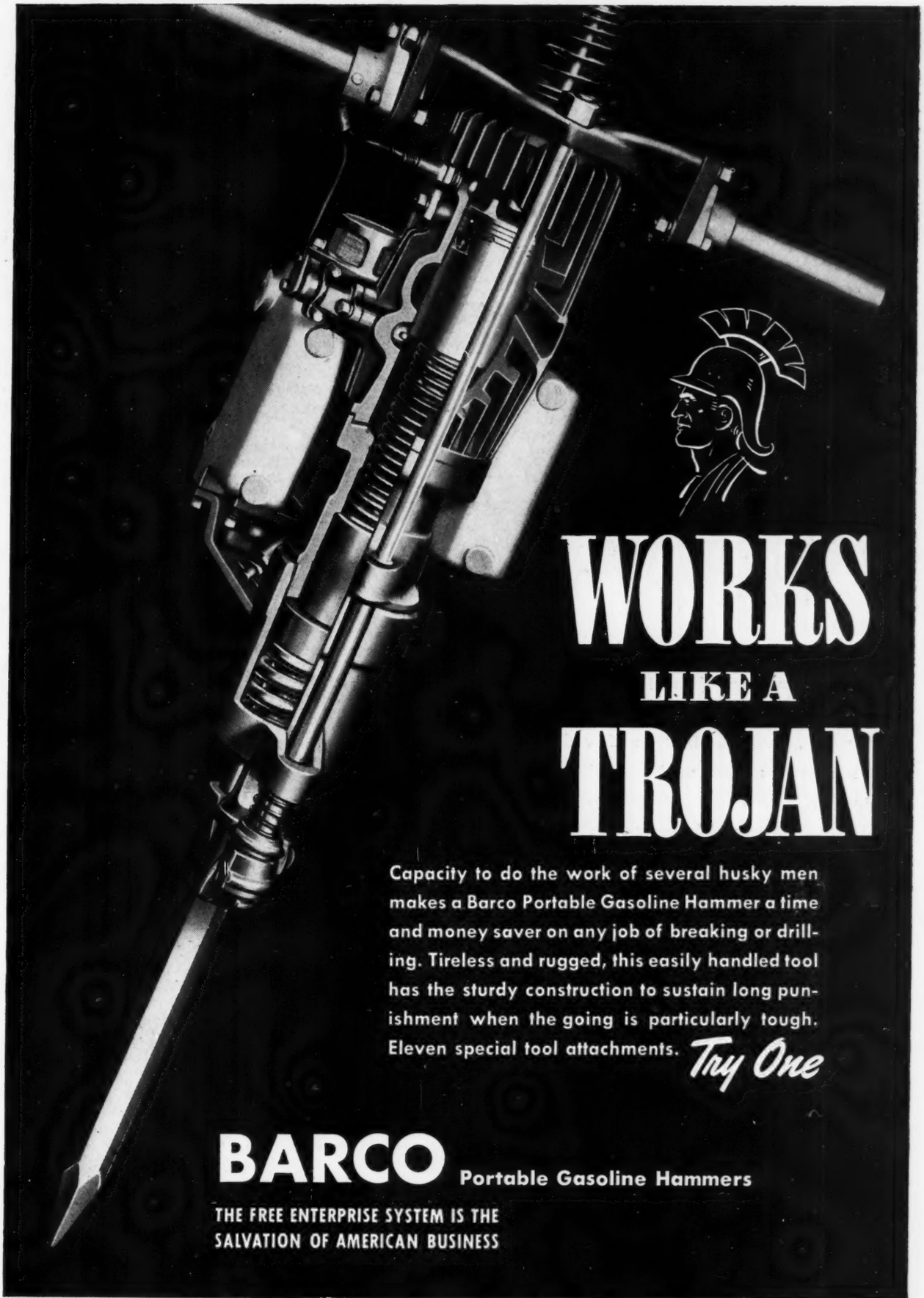
WORKS
LIKE A
TROJAN
Capacity to do the work of several husky men makes a Barco Portable Gasoline Hammer a time and money saver on any job of breaking or drilling. Tireless and rugged, this easily handled tool has the sturdy construction to sustain long punishment when the going is particularly tough. Eleven special tool attachments. Try One
BARCO Portable Gasoline Hammers
THE FREE ENTERPRISE SYSTEM IS THE SALVATION OF AMERICAN BUSINESS

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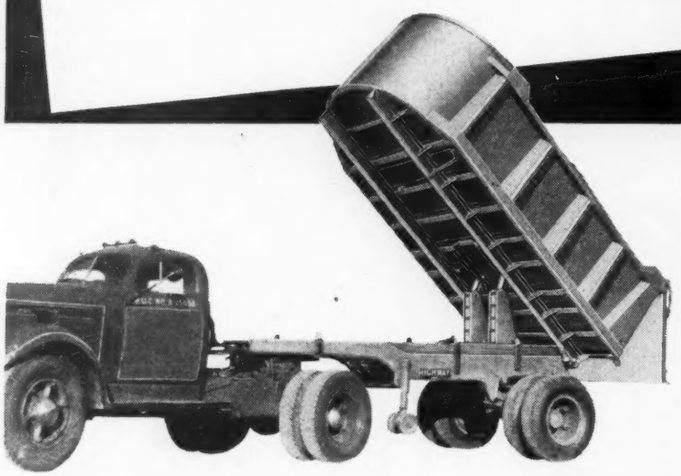
HERCULES

for the BIG Jobs!

For Any Trailer or Semi-Trailer
With Any Make of Fifth Wheel



On the heavy, tough jobs—that's where a Hercules body proves itself! Big loads, punishing service, continuous operation . . . that's the type of work where Hercules' built-in stamina shows up. Designed and built for heavy-duty service, Hercules dump bodies are available for installation on any trailer or semi-trailer.

Collect dividends through more and bigger payloads, lower cost operation. Your Hercules distributor is prepared to supply complete information and service. See him today for complete details about the features that only Hercules can deliver.

HERCULES
DUMP BODIES AND HYDRAULIC HOISTS
SPLIT SHAFT POWER TAKE-OFFS • COAL CONVEYORS

Only Hercules Delivers ALL These Features:

Center-Lift Hoist • Reversible Tailgate Hardware • Easy-Reach Tailgate Lever • Piston-Type Control Valve • Hoist Mounts Above Frame • Dash Controls for Hoist and Take-Off Accessible Hoist Cylinder • Patented Tire and Tool Pack

HERCULES STEEL PRODUCTS COMPANY . . . GALION, OHIO

(Continued from page 156)

single problem; the Engineers had to use about 5 tons of dynamite a day in addition to their heavy rooters. In cut-and-fill operations they moved about 1,105,000 cu.yd. of earth, including 218,000 cu.yd. from a bluff which obstructed the runways.

For the additional tons of coral needed in construction, the Engineers first extracted about 200,000 cu.yd. from scattered quarries, then concentrated on one big pit which eventually yielded 2,200,000 cu.yd. This great three-terraced quarry was situated 2 mi. from the field; a fleet of more than 150 dump trucks worked back and forth 24 hr. a day moving the coral fast enough to keep shovels and dozers busy.

At first these 2½- and 4-ton trucks used Japanese-built dirt roads, patched up with the minimum possible maintenance. But this procedure turned out to be a time-waster after all. Constant rains turned the roads into a mire, and hidden coral fragments ripped tires to shreds. Thus, to save time in the long run, two battalions undertook a new job; they devoted 5 days to building a three-lane asphalt-surfaced highway.

The Engineers called the new highway their Great Haul Road. Down its smooth lanes, loaded trucks moved at the rate of one every 40 sec. and output at the quarry jumped from 8,000 to 15,000 cu.yd. a day.

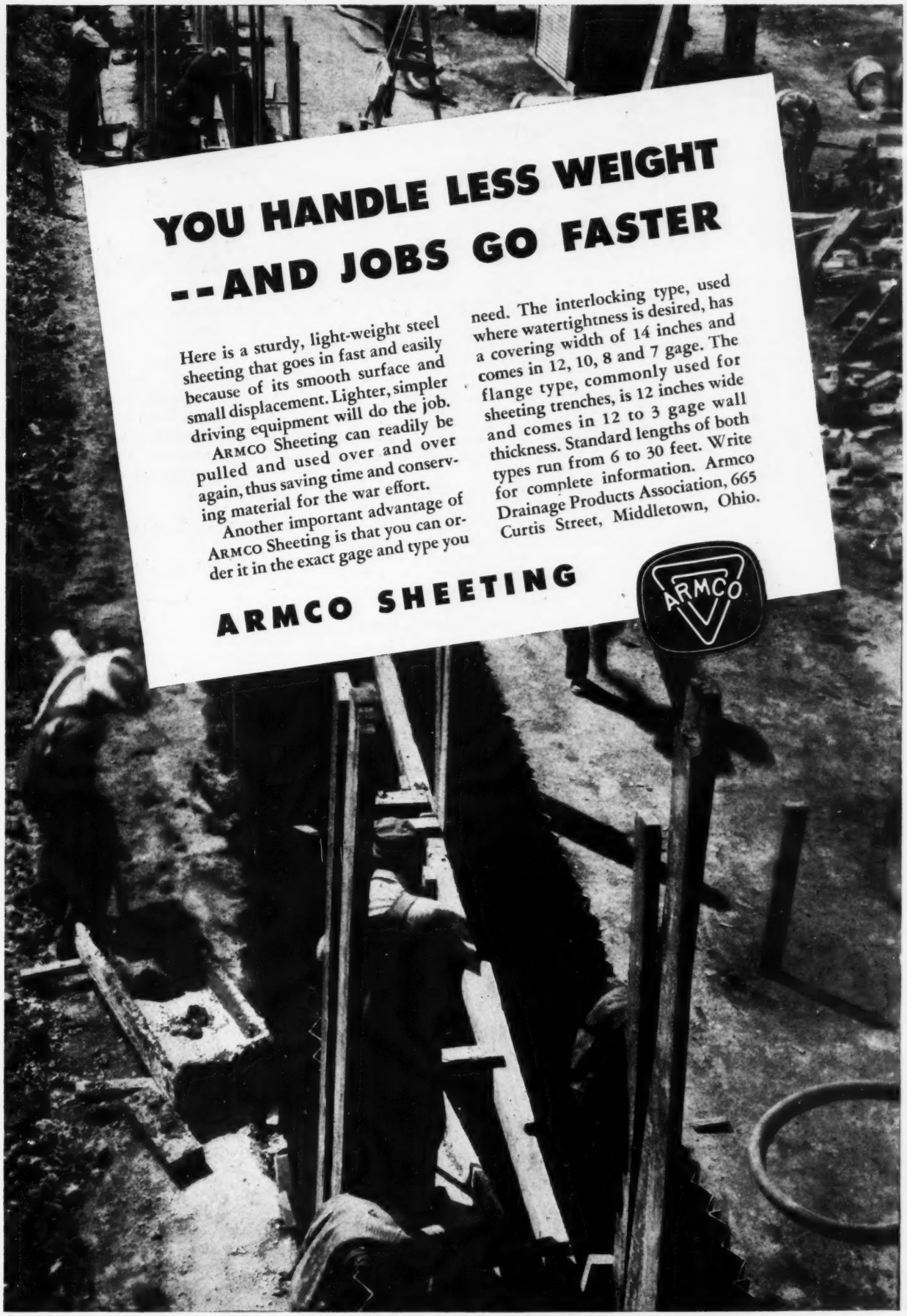
All the while, of course, the work went ahead at break-neck speed. For 3 full months the Engineers kept up their 24-hr.-a-day pace without a let up. Machines sometimes gave out and were put back into operation only after emergency orders of spare parts arrived from Hawaii. The men worked in dust and mud, sometimes under fire from Japanese snipers and artillery, often with interruptions from Jap bombing and strafing planes. One battalion, in addition to its constant work at the airfield, killed about 25 Japs and captured 20.

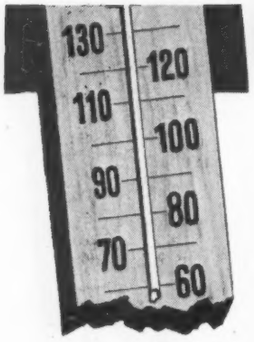
Field Ready in Record Time

Three months and 24 days after the Engineers started work on Saipan, they reported that Isely Field was operational for B-29's. The first B-29 came in for a successful landing, thus providing final proof that the field could take care of the huge Superfortresses. On Nov. 1, 1944, a B-29 took off on the first Saipan-based reconnaissance flight over Tokyo. On Nov. 24—just 5 months and 4 days after the Engineers went to work—the first Superfortress bombs from Saipan fell on Tokyo.

For the first time, a B-29 field had been constructed in the heart of a combat zone in the Pacific. In doing the job the Aviation Engineers had literally kept

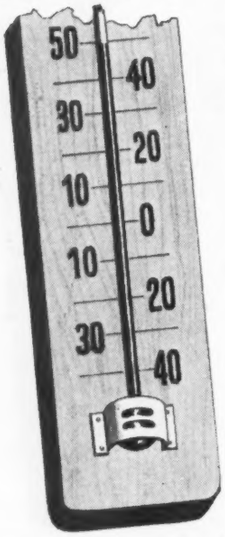
(Continued on page 160)


YOU HANDLE LESS WEIGHT
--AND JOBS GO FASTER
Here is a sturdy, light-weight steel sheeting that goes in fast and easily because of its smooth surface and small displacement. Lighter, simpler driving equipment will do the job.
ARMCO Sheeting can readily be pulled and used over and over again, thus saving time and conserving material for the war effort.
Another important advantage of ARMCO Sheeting is that you can order it in the exact gage and type you need. The interlocking type, used where watertightness is desired, has a covering width of 14 inches and comes in 12, 10, 8 and 7 gage. The flange type, commonly used for sheeting trenches, is 12 inches wide and comes in 12 to 3 gage wall thickness. Standard lengths of both types run from 6 to 30 feet. Write for complete information. Armco Drainage Products Association, 665 Curtis Street, Middletown, Ohio.
ARMCO SHEETING
ARMCO



NO SLOWDOWN

IF YOU USE CALCIUM CHLORIDE IN ALL CONCRETING BELOW 50 DEGREES



When the temperature drops from 70 degrees to 40 dgrees, it takes twice as long for normal concrete to acquire safe weight-bearing strength. But by using 2 pounds of calcium chloride for each bag of cement, this difference in strength is overcome, and normal strength is attained in the same time as during the summer months.

Why waste this valuable time when the use of calcium chloride will compensate for the reduction in temperature and put you back on normal 70 degrees summertime operating schedules for placing, finishing, removal of forms, and opening for use.

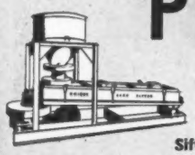
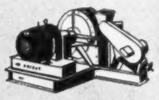
Concrete with calcium chloride has greater strength at all ages tested.

Use calcium chloride in all Portland Cement Concrete placed at 50 degrees Fahrenheit or lower. Get your copy of the new book, "Early Strength Concrete," explaining methods, amounts to use and results of tests by the National Bureau of Standards.

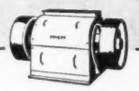
CALCIUM CHLORIDE ASSOCIATION
4145 Penobscot Bldg. • Detroit 26, Mich.

Materials

PROCESSING EQUIPMENT

Sifters, Crushers, Cutters, Dry and Liquid Mixers, Mills, Grinders, Pulverizers, Conveyor Systems, Complete Installations.



The handling equipment construction "know-how" of the Mercer Engineering Works, Inc., Clifton, N. J. . . . The more than 40 years processing equipment experience of Robinson Mfg. Co., Muncy, Pa. . . . All are embodied in and represented by

MERCER-ROBINSON, CO., INC.
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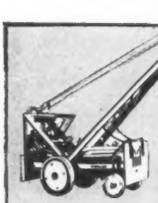
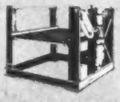
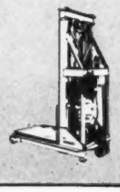


Materials

HANDLING EQUIPMENT

Trailer Trucks (All Types) Wheel Tractor Cranes (3 to 7 ton) Fork Lift Trucks, Lift Platforms, Hoists, Live Skids, Wheels, Casters.

(Continued from page 158)

an impossible schedule under impossible conditions.

★ ★ ★

Atomic Bomb Production

(Continued from page 90)

2,000 pneumatic tools and nearly 6,000 items of automotive equipment, including 1,000 passenger cars, 400 station wagons, 1,300 pick-up trucks, 750 buses and 2,500 construction-type trucks. The total number of pieces of equipment used in the period exceeded 14,000, valued at $20,000,000.

Clinton Engineer Works

One division of the Manhattan Engineer District, the Clinton Engineer Works, is located on a government reservation of some 59,000 acres 18 mi. west of Knoxville, Tenn. The large size and isolated location of this site were essential for security against possible hazards, the nature of which was unknown at the time the project was initiated.

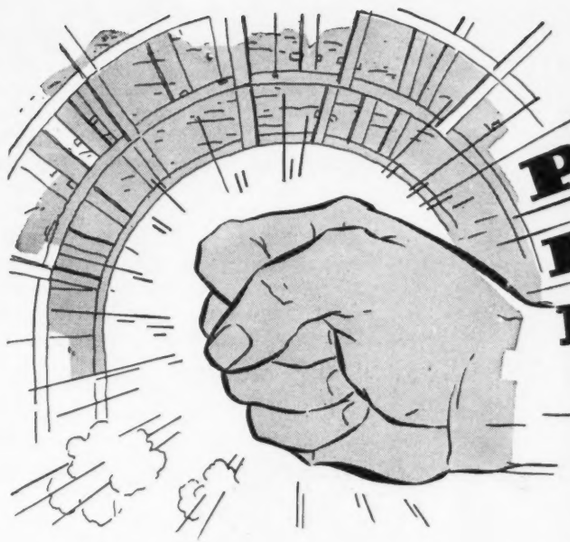
A government-owned city named Oak Ridge was established within the reservation at Clinton Engineer Works to accommodate employees and their families. They live under normal conditions in modest houses, dormitories, hutments and trailers, and have for their use all the religious, recreational, educational, medical and other facilities of a small city.

Construction Company Manages Town

In September 1943, the Turner Construction Co. of New York was asked by the Army's Corps of Engineers to send men to this rural Tennessee area and relieve the armed forces of all burdens of operation and community relationships in the town that was to spring up in record time. The job included management of all homes, apartments, police, fire, water supply and sewage systems, roads, streets, schools of elementary and secondary grades, stores and supermarkets, a hospital and several theaters.

In addition, the Turner Co., with the Roane-Anderson Co., a wholly-owned subsidiary, managed a farm with a herd of 3,000 cattle, a chicken ranch and an

(Continued on page 162)



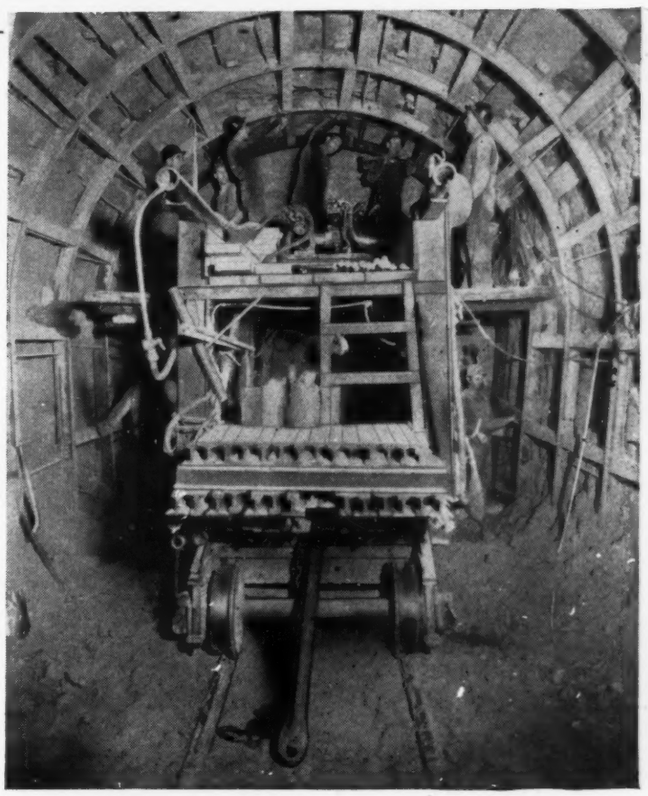
PUSH HEADINGS FASTER . . .

. . with Gardner-Denver Tunnel Drills . . .

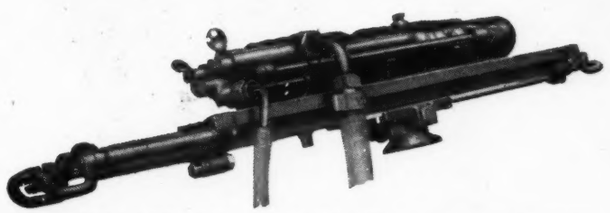
They're at the head of the class when it comes to advancing headings, these Gardner-Denver Continuous Feed Drifting Drills. They drill out the rounds in the shortest possible time . . . keep pushing the headings forward *fast.*

The Continuous Feed principle of Gardner-Denver Drifters assures maximum drilling speed in any type ground. The drill is automatically fed to suit the ground. With feed throttle set for the ground, the rest is automatic . . . the drill will advance as fast as the bit penetrates. The type of ground being drilled actually regulates the speed of the feed . . . the pressure of the feed remains constant for a given throttle setting.

For complete information on Gardner-Denver Tunnel Drills and their automatic pressure feed, write Gardner-Denver Company, Quincy, Illinois.



Why "Continuous Feed" Means Faster Drilling



NO TIME LOST FOR ADJUSTMENT—Drill runner loses no time and the drill loses no footage from frequent manual adjustment of the speed while drilling.

CORRECT STRIKING POSITION ALWAYS—The built-in motor feeds the drill continuously to the correct striking position for maximum drilling efficiency and maximum chuck life.

NO CROWDING—Simple adjustment of the throttle will increase the feeding pressure for harder ground or for a dull bit and automatically maintain maximum drilling without crowding the rotation. Excessive wear is eliminated.

LESS OPERATOR FATIGUE—Elimination of frequent adjustment plus ease of control cuts down operator fatigue.

GARDNER-DENVER *Since 1859*

(Continued from page 160)

electric power station. It even took care of the town's laundry, furnished domestic help, and served a million and a quarter meals a month in cafeterias seating 10,000 persons at a time. The job of managing Oak Ridge was handled by 10,000 employees of the construction company.

Oak Ridge is the principal center in the United States—and in the world—for the processing of material essential to atomic fission. It is situated where only oak and pine trees had previously dotted small farms, and is today the fifth largest city in Tennessee.

The total population of Oak Ridge is approximately 75,000 and consists of construction workers, plant operators and families; others live in immediately surrounding communities. The plants at Clinton Engineer Works, where raw material is processed, include more than 425 buildings.

The town itself spreads over an area of 8 sq. mi., and has 10,000 family units, dormitories for 13,000 residents, more than 5,000 trailers, and accommodations for more than 16,000 other inhabitants in huts and barracks. This city, built strictly for utility, has 13 supermarkets, 9 drug stores and 7 theaters. The United States government has spent $1,106,393,000 at Oak Ridge alone, but little of that money has gone for frills.

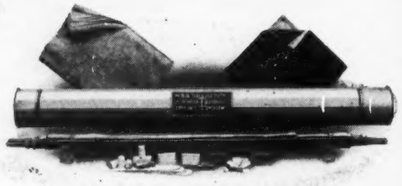
(Continued on page 164)

M·S·A
All-Weather
FIRST AID
KITS

These sturdy, steel cases are dustproof and weatherproof. The unit size packages offer a maximum of varied, individual first aid treatments in a minimum of space, and assure ease of maintenance. Carefully selected fills are available in 10, 16, 24, and 36-unit size kits. Mounting brackets permit placing of kits on walls of office or trucks, permitting easy removal so that the kit may be rushed to the scene of an accident. Furnished complete with carrying handle, two snap locks and instruction and contents sheets, M.S.A. All-Weather Kits are ideal for construction jobs of all kinds. Write for Bulletin FA-70.

FOR Efficient First Aid
ON YOUR CONSTRUCTION JOBS

M·S·A STANDARD
STRETCHER
OUTFIT



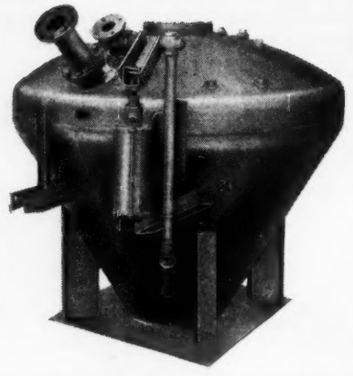
OVERALL DIMENSIONS 96" x 10½"
PART #2344

A sanitary, dustproof galvanized steel emergency outfit ideal for construction jobs. Contains, in addition to a sturdy Army type stretcher, rubber and wool blankets, splints, bandages, etc., for the care and comfort of the patient. May be readily mounted on wall, or in corner of office or truck. Available for instant use.

Request Bulletin FA-77.

MINE SAFETY APPLIANCES CO.
BRADDOCK, THOMAS AND MEADE STREETS
PITTSBURGH 8, PA.

Move Cement by Air-Floating It!

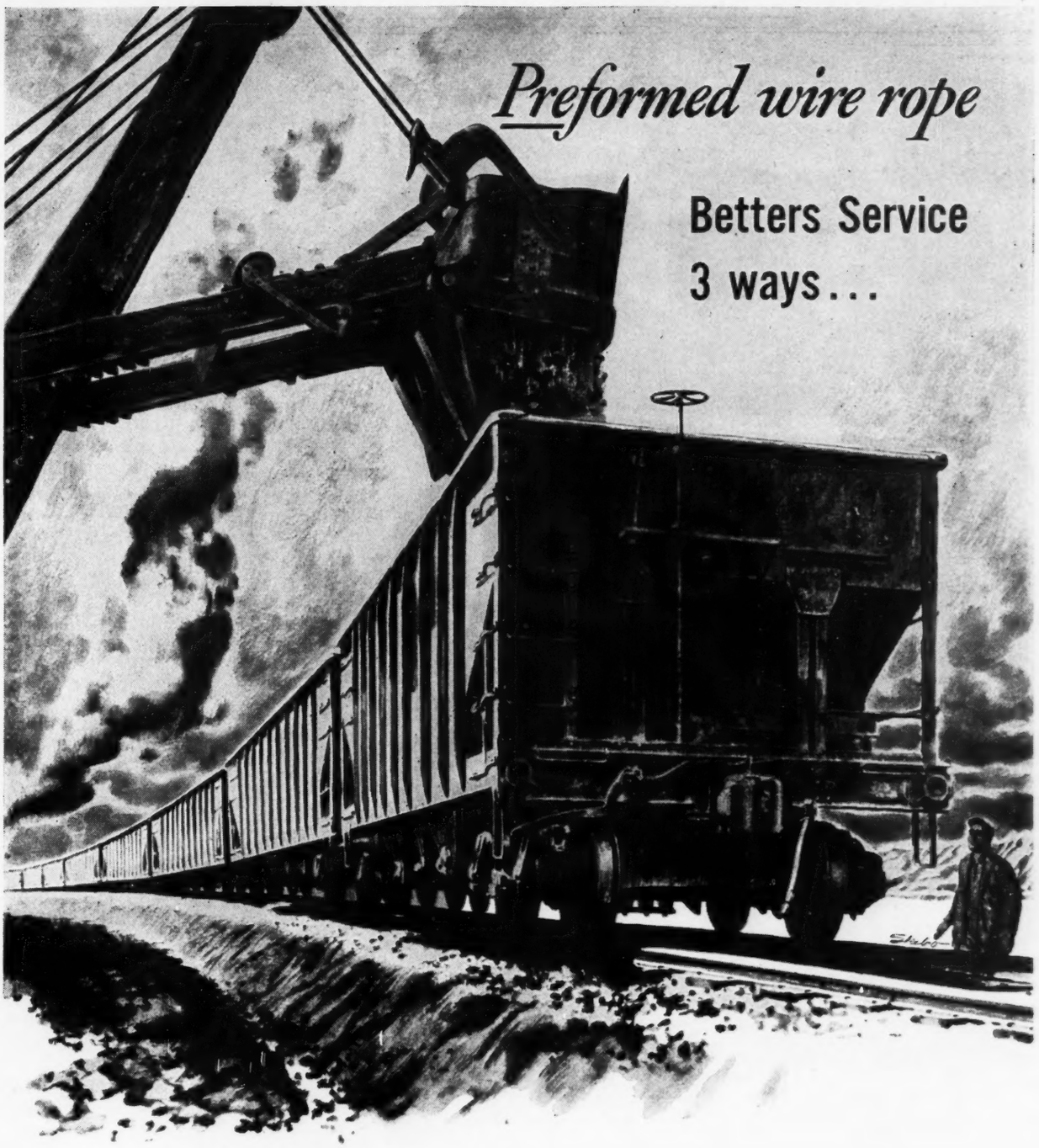


The ROBINSON AIR-ACTIVATED CONVEYOR SYSTEM is practical and efficient, saving in air and maintenance. It has been used on numerous big construction jobs as well as in process plants.

You can order the entire system installed including compressor, piping, storage tanks, etc. or just the activator, such as illustrated, to be used with your own accessory equipment.

Write for illustrated Bulletin No. 310.

ROBINSON AIR-ACTIVATED
CONVEYOR SYSTEMS
Division of MORSE BOULGER DESTRUCTOR CO.
211-C EAST 42nd STREET, NEW YORK 17, N.Y.
Representatives in all Principal Cities



RAILROADS own and operate thousands of pieces of heavy-duty equipment for which Preformed wire rope provides the muscle. Thus, Preformed is found on power shovels, cranes, derricks, hoists, winches—on car pullers, car retarders, dumpers—on loaders, unloaders, slings.

Railroads—like other industries—choose Preformed because it is *economical*, *safe*, and *saves wear* on equipment.

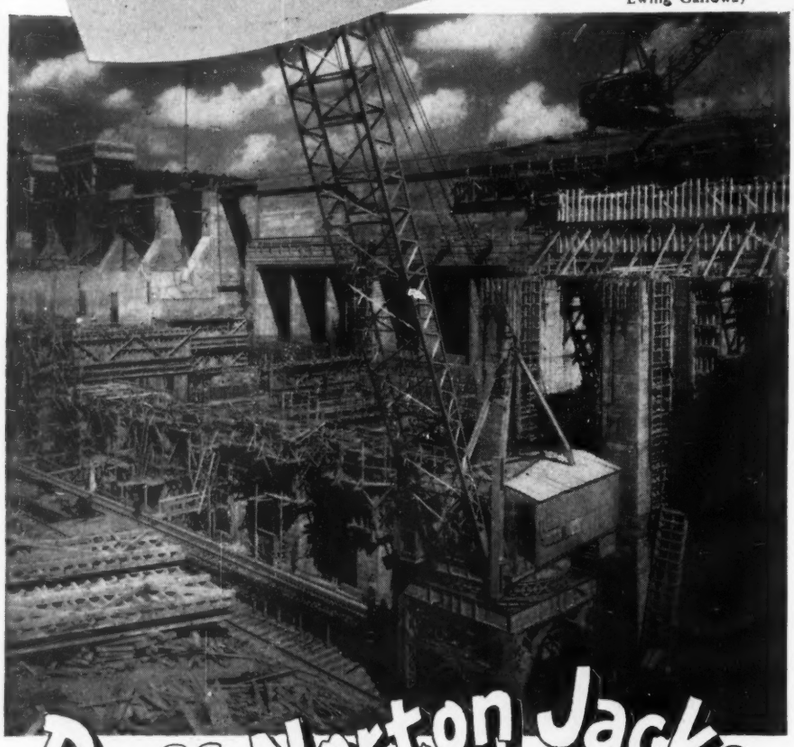
Its *economy* comes from longer life, due chiefly to lack of internal stress. It is *safer* for workmen because its wires lie flat when cut or broken, and because preforming relaxes wire rope and makes it flexible . . . It *saves wear* on expensive equipment because it reduces rotation on sheaves and spools evenly on drums.

Executives in *all* industries recognize the better service offered by Preformed.

ASK YOUR OWN SUPPLIER FOR PREFORMED WIRE ROPE

Built for the special requirements of engineering construction—

Ewing Galloway



Duff-Norton Jacks

It takes husky, powerful equipment to stand up under the severe requirements of construction work. Duff-Norton Jacks are built to take it. Strong and dependable, they give you long service life under the toughest kind of conditions. There is a type and size for every requirement. Write for the Duff-Norton catalog giving specifications and descriptions of the complete Duff-Norton line.

Your industrial distributor handles Duff-Norton Jacks.

The Duff-Norton Manufacturing Co.

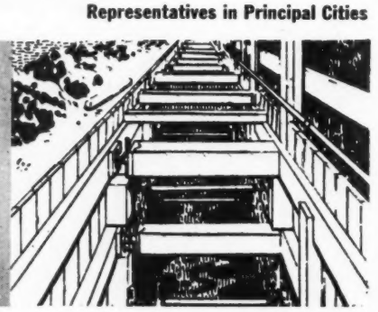
PITTSBURGH, PA.

Canadian Plant: Coaticook, Quebec

Representatives in Principal Cities

LARGE and SMALL DUFF-NORTON JACKS SERVE CONSTRUCTION . . .

From the time-saving Duff-Norton Trench Braces to the large, husky, heavy-duty screw jacks, Duff-Nortons are doing essential jobs on construction projects everywhere.



(Continued from page 162)

Hanford Engineer Works

On a government reservation of 631 sq. mi. in an isolated area 15 mi. northwest of Pasco, Wash., the Hanford Engineer Works was constructed to process raw materials for atomic bombs. Here, lying between the Yakima Range and the Columbia River, is situated a government-owned and operated town called Richland, with a population of approximately 17,000 made up of plant operators and their immediate families.

In addition to the 17,000 persons housed at the site, hundreds of workers live at Hanford, 8 mi. away. At the peak of construction activity, houses and facilities for 45,000 workers had to be provided. Living conditions at Richland are similar to those at Oak Ridge, Tenn.

As in the case of Oak Ridge, Tenn., consideration of security and safety necessitated placing this site in an isolated area. The plant and town occupy a rolling tableland containing for the most part an uninhabited region of gray sand, sagebrush and dried water courses. Development of these facilities required the excavating of 25,000,000 cu. yd. of earth, the placing of more than 780,000 cu. yd. of concrete, and the building of 345 mi. of roads. More than 8,500 major pieces of construction equipment were used in constructing the plant and town.

Plant Areas Subdivided

At the Hanford Engineer Works the manufacturing area is divided into three huge areas each of which in turn is subdivided into sections covering many square miles of ground. One of the main areas contains three enormous structures where atomic fission material is produced. The second contains three huge chemical plants where the material is purified and concentrated and the third prepares raw materials.

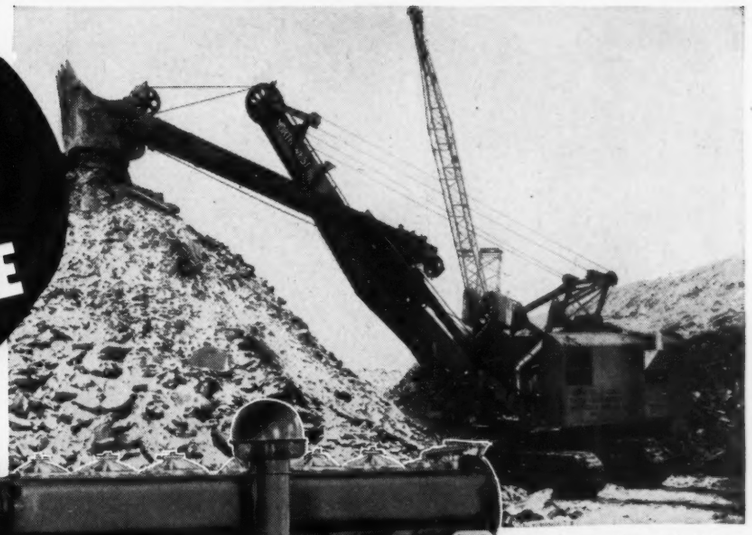
These plants, costing many millions of dollars, were designed, constructed and put into successful operations on the basis of earlier research work using quantities measured in micrograms. It is the first time that a direct expansion to industrial proportions has been accomplished with a process worked out on so small a scale in its development stages.

The finished plants at Hanford Engineer Works are huge rectangular structures 800 ft. long. The plants are remarkable in that they handle enormous quantities of materials through many successive processes with no human eye ever seeing what actually goes on, the operations being controlled by a complicated series of dials and panels.

A special laboratory, dealing with the

(Continued on page 166)

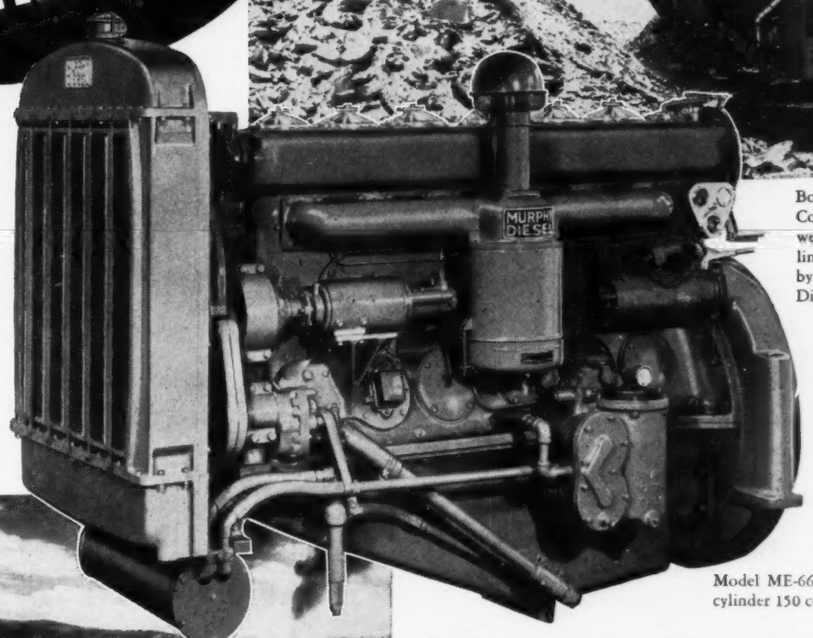
RUGGED COMPACT DEPENDABLE



Booneville Coal Sales Corporation's "Northwest" Shovel and Dragline both are powered by Model ME-6 Murphy Diesel Engines.

Features:

- Murphy UNIT INJECTOR
- Safety Control
- Plain Open Combustion Chamber
- Hydraulic Servo-Type Governor
- Oil-cooled Pistons
- Precision Bearing-Shells
- Oil Cooler
- Electric Starting



Model ME-66, 6" x 6¼", 6-cylinder 150 continuous H.P

Model ME-650, 106 KW Murphy Diesel Generator Set powers R. P Herrick's "Cedarapids" Hot Asphalt Plant.

YEAR after year, MURPHY DIESEL Engines and Generator Sets continue to prove their outstanding value for heavy-duty equipment . . . where portable or stationary power is required in field . . . where rugged construction, compactness and relatively light weight, along with highest standards of dependability for heavy-duty service are demanded.

Easy to start, economical to operate and maintain, MURPHY DIESELS are making good on the toughest jobs. Specify MURPHY DIESELS on the next equipment you buy, and check their advantages for re-powering your present equipment. Making MURPHY DIESELS a "must" on your jobs means More Power, More Profit!

MURPHY DIESEL COMPANY
5339 W. Burnham St., Milwaukee 14, Wis.

ARMY NAVY

★ *Buy U. S. War Bonds* ★

More Power

MURPHY DIESEL

Reg U.S. Pat Off

More Profit

Engines: FROM 90 to 215 HP
Generators: FROM 60 to 115 KW

"FIELD-PROVEN *Power*"

105

(Continued from page 164)

many technical problems involved in combining the component parts into an effective bomb, is located in an isolated area near Santa Fe, N. M. This laboratory has been planned, organized and directed by Dr. J. Robert Oppenheimer.

As the city of Santa Fe is an hour's drive from the laboratory, a city to accommodate 7,000 was built nearer the laboratory for its workers and their families. The Los Alamos Boys' School, located at the laboratory site, was taken over, and the Army began immediately the erection of 37 buildings in the technical area, and 200 in scattered locations. Three hundred other buildings contain 620 family units. Military barracks, hospital buildings and structures for administrative officers were added.

Supplemental Plants and Laboratories

Certain other manufacturing plants, much smaller in scale than those described here, are located at other points in the United States and Canada for production of necessary materials. Laboratories at the University of Columbia, Chicago and California, Iowa State College, and at other schools, as well as

(Continued on page 168)

Extra Long...Extra Wide

Insley crawlers are extra long . . . extra wide . . . *at no extra cost.* The added surface area reduces ground pressure. Crawlers are individually controlled and self-cleaning. That's another reason why the Insley Excavator does things and goes places in tight spots and on any terrain—no matter how soft, rough or tough the going may be.

A limited number of Insley Excavators may now be obtained by civilian buyers upon authorization of WPB. For lower cost yardage on your job, see your dealer today about a new ⅜ or ½-yd. Insley Excavator. Designed for use with five easily interchangeable attachments . . . shovel, crane, hoe, clamshell and dragline . . . crawler, rubber or rail mounted . . . gasoline, diesel or electric powered.

INSLEY MANUFACTURING CORP., INDIANAPOLIS 6, IND.

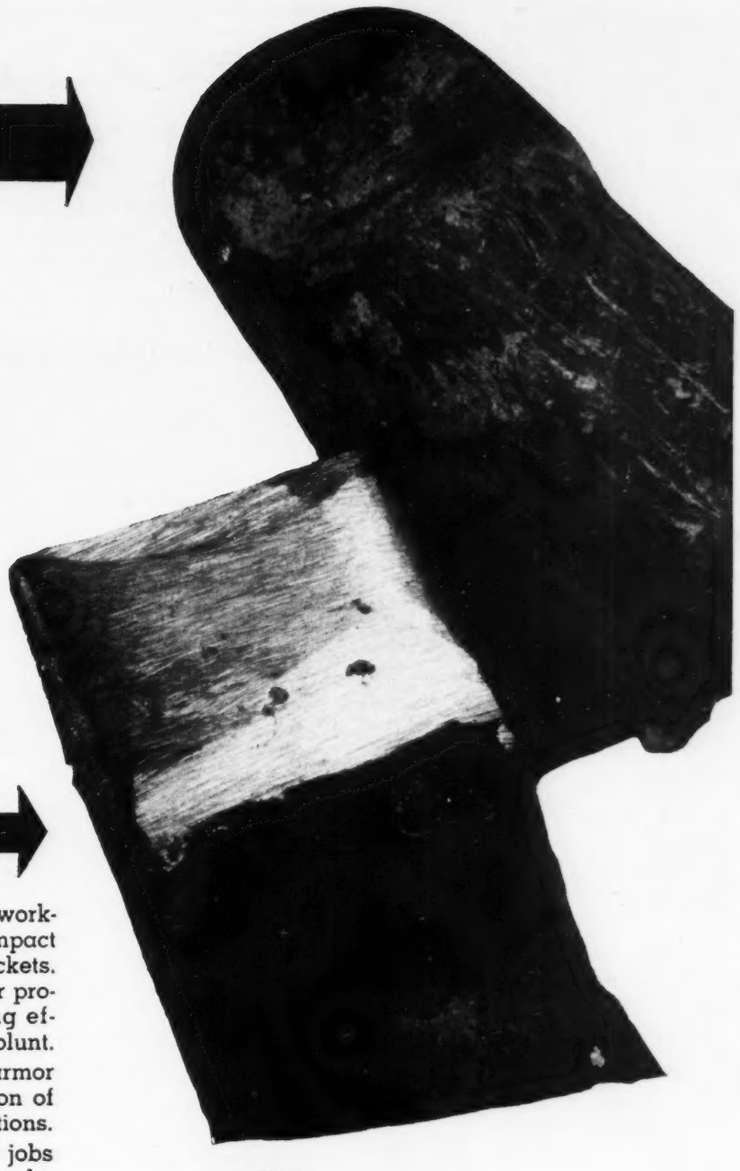
Shunk
Snow Plow and Ice Removal
BLADES
Proved record of superior performance. Made of specially developed steel to withstand severe service conditions.
FOR ALL TYPES AND MODELS OF SNOW PLOWS
Various widths, lengths, thicknesses--flat or curved--standard or special--punched ready to fit your machine.
SHUNK SAW-TOOTH ICE BLADE
Amazingly effective. Thoroughly breaks up and removes heavy, slippery ice and snow formations. Replaces all types of snow plow blades or maintenance units. Write for Bulletin and name of nearest Distributor.

Shunk
MANUFACTURING COMPANY
ESTABLISHED 1854
BUCYRUS, OHIO.

Blunt ➡ isn't it?...

but MIR-O-COL Hard-Facing will rebuild your Bucket-Teeth

Sharp like this ➡



➡ When your excavating equipment is working in heavy granite or shale and sand, impact and abrasion grinds teeth and lips of buckets. This wear is one of the costly losses on your production chart, because material handling efficiency of the bucket drops as teeth wear blunt.

MIR-O-COL metal rods are specified as an armor of hard alloy applied over a built-up section of either mild steel or an insert in such conditions.

Hard-Facing rod No. 1 is recommended for jobs where a thin overlay of extreme hardness is desired to protect against excessive abrasion. Hard-Facing rod No. 2 is an all-purpose type for use where severe impact as well as abrasive conditions will be met.

MIR-O-COL Hard-Facing can be applied by either oxy-acetylene or electric arc methods. These hard-facing materials cost only a small portion of the price of new teeth, and—in addition—provide plus advantages of reduced maintenance time and improved operating efficiency of equipment at work. Stocked now by supply houses in most construction centers, MIR-O-COL Hard-Facing metals are easy to buy. Experience proves they are easy to apply. See your welding supply company or write to MIR-O-COL.

SEND FOR YOUR FREE COPY

To learn more about the application of MIR-O-COL Alloy Company hard-facing rods, write to your local welding supply jobber or direct to the company, attention Department B-16. We will send you a copy of "Weldors' Guide to Successful Hard-Facing."

MIR-O-COL
HARD-FACING RODS
ALLOY COMPANY
2416-60 EAST 53RD STREET, LOS ANGELES 11, CALIFORNIA

MAIN OFFICE	EXPORT OFFICE
2416-60 East 53rd Street, Los Angeles 11, California	American Steel Export Co., Inc. 347 Madison Ave., New York 17, N. Y. 448 S. Hill St., Los Angeles 13, Calif.

(Continued from page 166)

certain industrial laboratories, have contributed materially in carrying on research and in developing special equipment, materials and processes for the project.

A laboratory has been established in Canada and a pilot plant for the manufacture of material is being built. The work is being carried on by the Canadian government with assistance from, and liaison with, the United States and the United Kingdom.

Builders and Operators

Space does not permit a complete listing of industrial concerns which have contributed signally to the success of the project, but mention must be made of a few. The Hanford installations in Washington were designed and constructed by E. I. duPont de Nemours & Co. under supervision of Col. F. T. Matthias. The principal construction work was handled by the Morrison-Knudsen Co., Boise, Idaho.

At Clinton, Col. Kenneth D. Nichols, district engineer, is in charge of all operations. A special subsidiary of the M. W. Kellogg Co. of New York designed one of the plants at the Clinton Engineer Works; it was constructed by the J. A. Jones Construction Co. (Edwin Jones, general manager, and John D. Watson, chief engineer), and is now operated by the Union Carbide & Carbon Co. The main process building has a floor area of 5,568,000 sq. ft. For this plant, Ford, Bacon & Davis designed and constructed a building of 800,000-sq. ft. floor area to condition equipment prior to its installation in the working units. A 238,000-kw. power house to serve the plant was built by the Jones organization according to plans by Sargent & Lundy. Construction of the main process buildings for the plant got under way Sept. 10, 1943, and the first units went into operation Feb. 20, 1945. In May 1945, the working force of the J. A. Jones Construction Co. on this project numbered 25,000.

Complicated Project

The second plant at Clinton, totaling 270 buildings, was designed and constructed by the Stone & Webster Engineering Corp. of Boston. According to Russel T. Branch, Stone & Webster president, who was in direct charge of construction, the Clinton Engineer Works was the most complicated project ever undertaken. T. R. Thonburg is now in charge for the builders. This plant is operated by the Tennessee Eastman Co. Construction started in February 1943,

(Continued on page 170)

Don't Let This Happen To You!

Cave-in of Sewer Kills Worker; Buried 10 Feet

A man identified as Vincent Arizzi, about 50, an employee of a sewer contractor, died yesterday in a cave-in of a sewer at 1139 E. 43rd st. He was buried under 10 feet of earth and firemen worked 15 minutes to extricate him. He was dead before arrival at Chicago Memorial hospital. Other workers escaped injury. (Chicago Tribune.)

Too frequently such grim stories as that reproduced above appear in the day's news. A dependable means of preventing cave-ins is available.

Simplex Trench and Timber Braces: 18" to 60" long (in closed position)

Simplex Trench and Timber Braces are unbreakable; stronger and more durable than malleable braces. Balls and sockets and lever nut are drop-forged (an exclusive Simplex feature), and the screw is accurately machine cut. Much less costly than cave-ins and re-digging.

ARMY NAVY

Templeton, Kenly & Co.
Chicago (44) Ill.

Simplex
LEVER · SCREW · HYDRAULIC
Jacks

Breakdowns COST Money!

Avoid 'Em! Get Done Ahead of Schedule with

VIBER
Concrete Vibrators

Vibers are rugged and FASTER than ever—now 9500 RPM in concrete! If time counts and breakdowns hurt, switch to dependable VIBER-ation.

Find out about Viber's easy-to-carry size and other exclusive features. Write for catalog.

VIBER COMPANY

726 South Flower Street
BURBANK, CALIFORNIA

Keep ahead of Schedule with GATKE High-Heat-Resisting

Asbestos BRAKE MATERIALS

GATKE Brake Blocks and Frictions

Disc Type Clutch Facings

Cone Type Clutch Facings

How do GATKE Brake Materials speed operations and save money? They keep operating and avoid delays. They pick up and release with smooth, positive, non-grabbing action for faster operation—require fewer adjustments.

GATKE Brake Materials are engineered and service proved for every brake and clutch of Excavating, Road Building and Construction Equipment. Just tell us what you need!

GATKE MAKES
Brake Lining
Clutch Facings
Frictions
Non-Metallic
Bearings
Sheet Packing

GATKE CORPORATION

226 N. LaSalle Street
Chicago 1, Illinois

This engineer used an Asphalt-Gravel mix to resurface a worn street

Texaco Asphaltic Concrete pavement, using crushed gravel aggregate, laid over worn concrete in South Brewer, Me., by Lane Construction Co.

SPECIFICATION
for Asphalt pavement laid on a worn concrete street

1-INCH BINDER COURSE

61.6%	¾-in. maximum size crushed gravel
33.1%	sand
5.3%	85-100 penetration asphalt

1-INCH WEARING SURFACE

46.0%	½-in. maximum size crushed gravel
45.9%	sand
1.5%	filler
6.6%	85-100 penetration asphalt

With a worn concrete pavement in need of resurfacing and a convenient source of gravel and sand, the city of South Brewer, Me., solved its problem in a way other engineers will find interesting.

A two-course Texaco Asphaltic Concrete pavement has been laid over the worn concrete on South Main Street in South Brewer, using crushed gravel as the principal aggregate. Note the panel on the left.

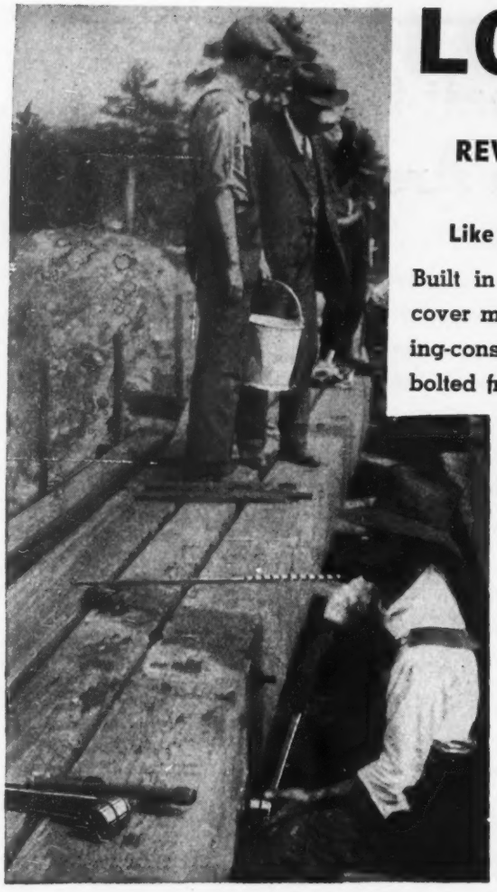
Hundreds of miles of worn streets and highways throughout the country have been salvaged efficiently and economically by utilizing them as bases for Texaco Asphaltic Concrete. Stone, slag and gravel provide satisfactory aggregates for this durable type of construction.

If you have a worn road or street in need of a new surface and a nearby source of gravel, follow the successful example of South Brewer. Texaco Engineers, who are Asphalt specialists, will be glad to assist you with this or any other paving problem. Write our nearest office.

THE TEXAS COMPANY, Asphalt Sales Dept., 135 E. 42nd Street, New York City 17
Boston 16 Chicago 4 Denver 1 Houston 1 Jacksonville 2 Philadelphia 2 Richmond 19

TEXACO REG. T. M.

TEXACO ASPHALT



LOWELL

THE "OLD RELIABLE"

REVERSIBLE RATCHET WRENCHES.

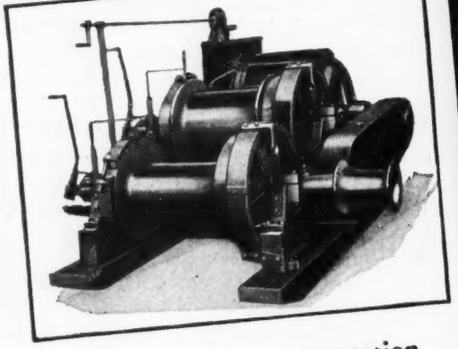
Like Water — They Satisfy

Built in a wide range of sizes to cover many needs of the engineering-construction field. Bridge work, bolted frame construction and pipe coupling work are just a few of the many jobs where LOWELL Wrenches are preferred on account of their STRENGTH and SAFETY.

SEND FOR THE LOWELL CATALOG TODAY

LOWELL WRENCH CO.
WORCESTER, MASS.

Hoists to Fit the Job



Lidgerwood hoists have earned a 70-year reputation for dependability and efficiency *on the job*. There's a Lidgerwood gasoline, steam, electric or Diesel hoist to fit every construction need. When you need a hoist inquire *first* of LIDGERWOOD.

HOISTS FOR:
CABLEWAYS
INDUSTRIAL PLANTS
CONTRACTORS
MINES—DOCKS
RAILWAYS

LIDGERWOOD
ESTABLISHED 1873
Manufacturing Company
MAIN OFFICE AND WORKS · ELIZABETH, NEW JERSEY

(Continued from page 168)

and the first units began operating in January 1944.

A smaller pilot plant, not numbered among the three large plants, was installed at Clinton to employ a third method of concentrating U-235 uranium. This plant comprises about 20 buildings, the largest being 525x82 ft. by 75 ft. high. The U. S. Naval Research Laboratory performed the research and developmental work for the plant, which was designed and constructed by the H. K. Ferguson Co., with C. W. Roberts in charge. It is operated by the Fercleve Corp., an affiliate of the Ferguson Co. Construction started July 13, 1944, and the plant was completed Dec. 15, 1944.

Equipment was supplied by nearly all of the largest firms in the United States, including Allis-Chalmers, Chrysler, General Electric, and Westinghouse. These are only a few of literally thousands of firms, both large and small, which have contributed to the success of the program. Douglas Fir Plywood Assn. states that 6,300 prefabricated plywood structures were erected to house workers at the Clinton, Tenn., and Hanford, Wash., plants. (CONSTRUCTION METHODS, Sept. 1944, page 66.)

★ ★ ★

Permeable Pile Jetties

(Continued from page 81)

Here, eleven creosoted pile jetties were built between 1929 and 1937 to save trackage of the Missouri Pacific lines from destruction. In addition to the wood jetties, steel angle retards were cabled in place along the face of the bank behind them. The bank has now been stabilized and a considerable amount of deposition in the form of drift and sand bars has been created there.

This work was done under supervision of the Missouri Pacific Lines at Houston, Tex. C. S. Kirkpatrick is chief engineer, and R. E. Caudle is principal assistant engineer directly in charge of plans and construction.

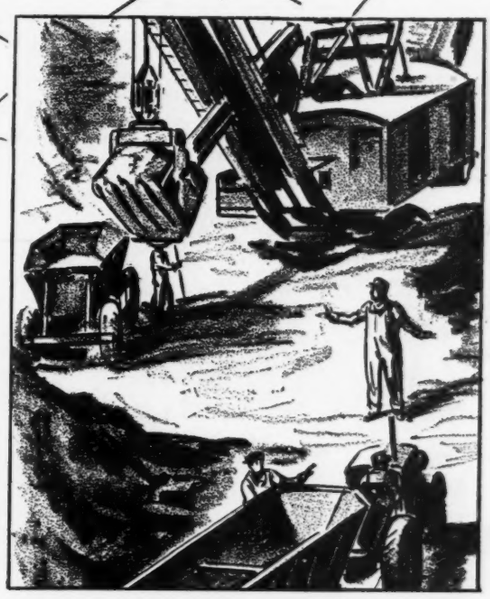
In general, the pile jetties are so

(Continued on page 172)

Do you know that . . .

LAST YEAR MORE AIRLINE PASSENGERS IN THE UNITED STATES FLEW ON SINCLAIR PENNSYLVANIA MOTOR OIL THAN ON ANY OTHER OIL . . . SINCLAIR AVIATION GASOLINE WILL AID FLYING ON NATIONAL AND INTERNATIONAL ROUTES.

SINCLAIR TANK TRUCKS OPERATE OUT OF 2000 WHOLESALE BULK PLANTS WHICH SERVICE INDUSTRIAL PLANTS, AS WELL AS MANY THOUSANDS OF SINCLAIR DEALER STATIONS, WITH PETROLEUM PRODUCTS.



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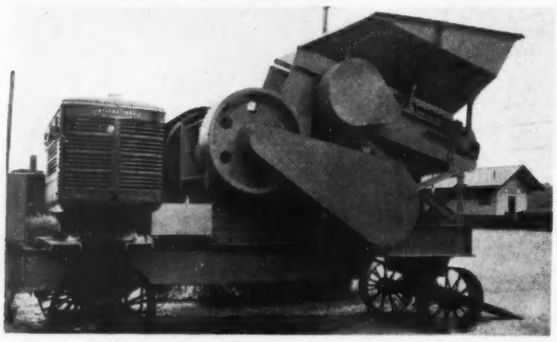

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(Continued from page 170)

placed with respect to the bank that a change in direction of the current in excess of 30 deg. at any one point is not attempted. Unless of considerable length, one jetty alone seldom solves a bank cutting problem. Usually a group of two or three or more is installed to function as a unit for this purpose.

Construction Details

Three-pile bents spaced at 10-ft. centers form the basic framework of a typical jetty. The center pile in each bent is driven vertically and the outer ones at a batter of 3 in 12. A minimum pile penetration of about 20 ft. below streambed is required. Spacing of the piles at the top of the bent is 4 ft. and they are capped with an 8x8-in. by 10 ft. or larger timber.

An extra pile is driven between bents in the row along the river face to provide nailing support for wales or fender plank at 5-ft. centers. All bents and the extra support piles are sash- sway- and strut-braced with 3x8-in. pieces. Tops of all bents are tied together longitudinally by two lines of 6x8-in. timber, laid flat. The fender plank are 3x8-in., spiked to the face of the jetty from low water level up to the caps. These rows of planks are separated by 2-in. gaps.

Fender plank deflect the main flood current away from the river bank. The spaces between the face plank, however, make the jetty permeable, retarding the velocity of the water passing through and causing it to deposit some of its sedimentary load behind the jetty. Retarding devices installed behind the jetty along the face of the bank aid the building-up process with accretions of sand and silt.

★ ★ ★

Stepped Concrete Piles

(Continued from page 115)

$36,000,000 Bermuda Naval Base constructed by F. H. McGraw & Co. and Purdy & Henderson Co. for the Navy Department in 1941-42, for which the Army-Navy "E" was awarded.

(Continued on page 174)

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But those big ones can put up a stiff fight unless you tame them with

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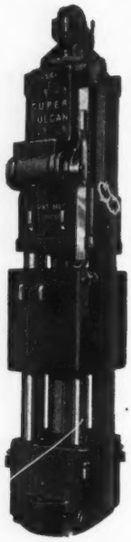

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(Continued from page 172)

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Bethlehem Steel Co.	Structural Steel
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Williamsburgh Steel Products Co.	Steel bucks
	Masonry
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West Detroit Glass Co.	*Granite
Cold Spring Granite Co.	Tile and Terrazzos
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*Suppliers

Plans and specifications for erecting

(Continued on page 176)

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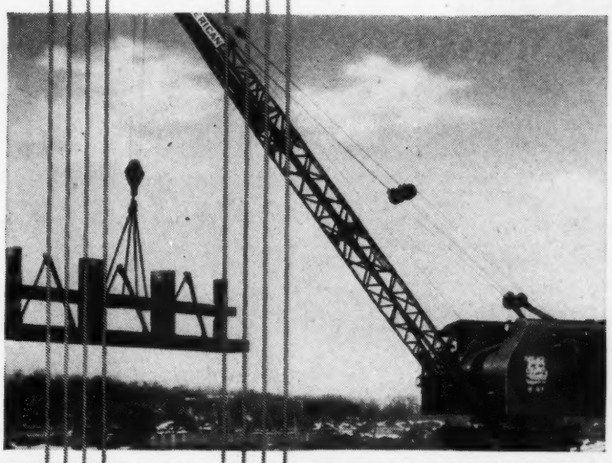

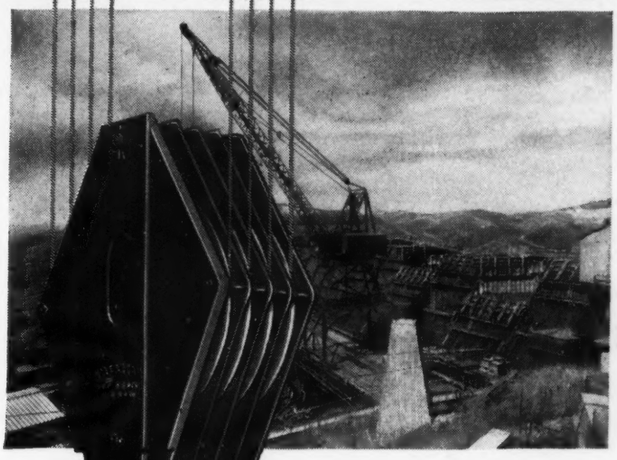

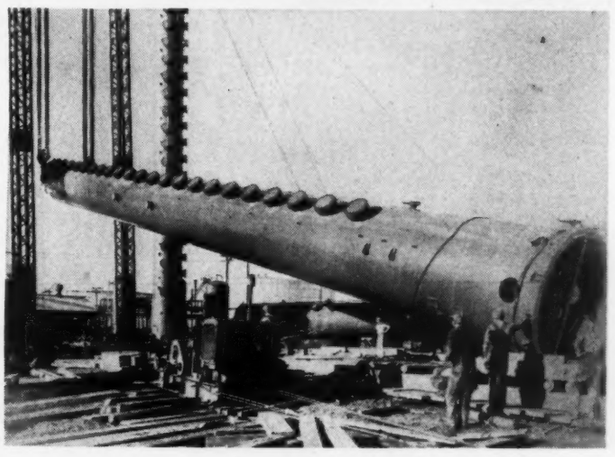

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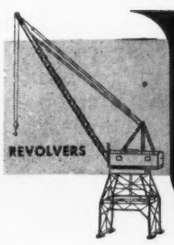

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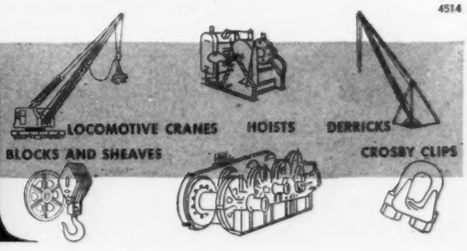

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Wherever there's hand shoveling, here's the way to start cutting costs. Equip your men with RAZOR-BACK, the only fully modern shovel with tapered blade thickness and tubular shank — giving you full 13 gauge thickness and strength up the middle, to take the cutting wear and stand the strain, but only 15 gauge over-all weight and better balance to speed the moving of material.
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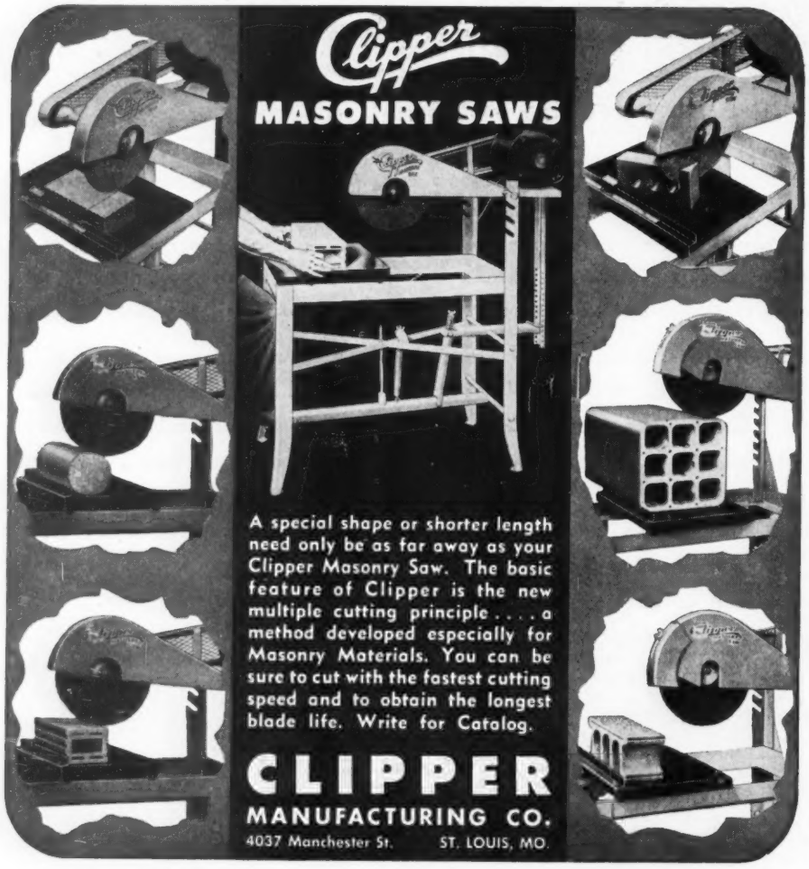
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(Continued from page 174)

veterans' hospitals are voluminous. In addition to 123 separate blueprints, a book of specifications consisting of 600 single-spaced, typewritten pages—containing some 246,000 words—give detailed construction requirements.

★ ★ ★

Heavy Concrete Test Sections

(Continued from page 103)

Dowels of 1½-in. dia. were used in the 12-in. pavement and of ¾-in. dia. in the 9-in. slabs. Reinforcing steel for temperature stresses also varied in diameters, ½ in. for the 12- and 18-in. slabs and ⅜-in. for the 9-in. slab. It was placed 2 in. below the surface on 12-in. centers both ways.

Dowels were held in place by means of special headers designed for adequate support and for ease of removal after the concrete had set. For the 18-in. slabs, dowels were held in place by holes bored at 12-in. spacing on the center line of two 4x9-in. planks placed edge to edge and held together by cleats. Headers of this type were easy to remove. The upper half could be lifted off and the lower half pulled out horizontally and allowed to drop away from the dowels.

Headers for dowels in the 9-in. paving did not warrant the expense of boring holes but the same general design was used. The halves making up the header were separated for the thickness of a dowel by wood strips or fillers nailed to the edge of one of the header planks, between dowel positions.

Because of the thickness of the 18-in. pavement which was put down in a single pour, special provision for vibration was considered necessary. Two portable, bayonet-type vibrators, each driven by a gasoline engine, were used to spread and work the mix ahead of the finishing machine. These vibrators could be moved ahead by one man and could be worked in the lower portion of the thick slab. With this advance help from vibrators, the concrete was conditioned so that the standard mechanical vibrating machine could give it the necessary agitation. Placing of the concrete otherwise followed conventional methods. A concrete paving mixer advanced along either side of a 20-ft. strip delivering continuously throughout the run. Each

(Continued on page 178)

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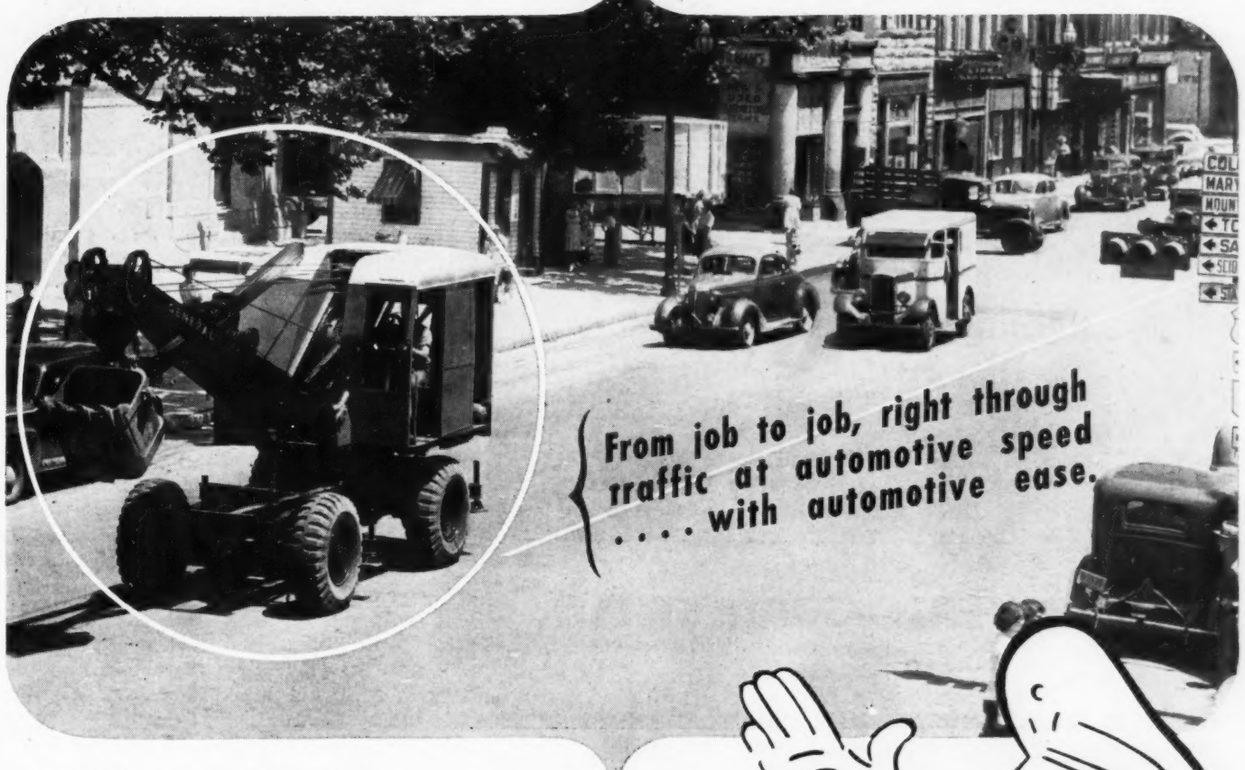
The Latest and Greatest Development of a 5-Year-Old INDUSTRY "FIRST"



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ONE-MAN . . . ONE-ENGINE . . . ON RUBBER

Five years ago General "scooped" the industry with a great "first"—the one-engine, one-man operated, pneumatic-tired Supercrane. Carrying this development a great stride forward, General now takes the "wraps" off the *original* "Machine of Tomorrow." First announced more than a year ago, General's revolutionary Type 10, Model 105, is a profit-building rig that will go out and do more kinds of work—faster, better and cheaper—than you ever believed possible with a single machine . . . ½-yard shovel, crane, backhoe, dragline, clamshell, magnet and piledriver "rolled into one" and rolling with automotive smoothness on a cushion of air.

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Fast highway travel (20 "plus" miles per hour); optional 4-wheel drive; air booster steering; independent, easily accessible assemblies; heavy-duty engine, transmission and clutches; self-counter-weighting machinery; 4 speeds forward and reverse; quick interchangeability of attachments . . . are only a few of the remarkable test-proven advancements. Write for the full story today!

THE GENERAL EXCAVATOR CO., Marion, Ohio. Builders of the famous Supercranes and a complete line of shovels, draglines and related equipment; diesel, gas, electric—½ to ¾ yd.

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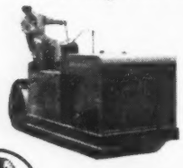

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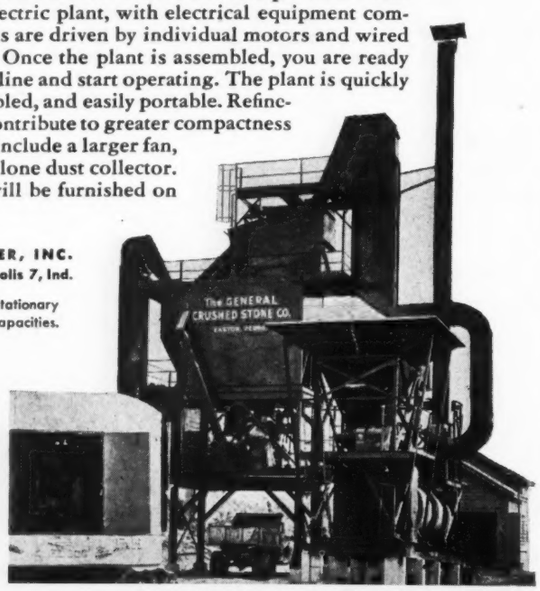

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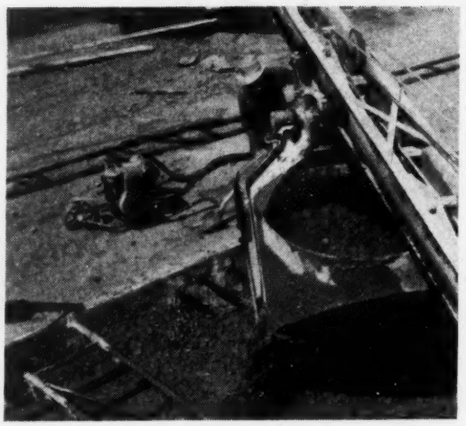


VIBRATING EQUIPMENT includes small gasoline engine which is moved forward by one man. Square-nosed shovels help spread mix as it is placed in layers by skips from two mixers advancing along either side of 20-ft. strip.

(Continued from page 176)

20-ft. strip was divided into square panels by dummy joints at 20-ft. intervals.

Dowel supports or jigs, made up of welded pipe, held contraction-joint dowels in place while the concrete was poured. The jig was lifted out and moved ahead just before the mechanical finishing machine moved over the joints. Five men were usually required on this operation.

Expansion joints were placed at 100-ft. intervals. To provide room for movement of the steel bars at the expansion joints, a 6-in. length of tube with a cork in one end, was placed over an end of each bar. The cork, with its ability to compress, permits movement of the steel bar under temperature changes. Movement was assured by greasing one-half the length of the bar to destroy its bond with the concrete. A crew of five men was also required for expansion joints.

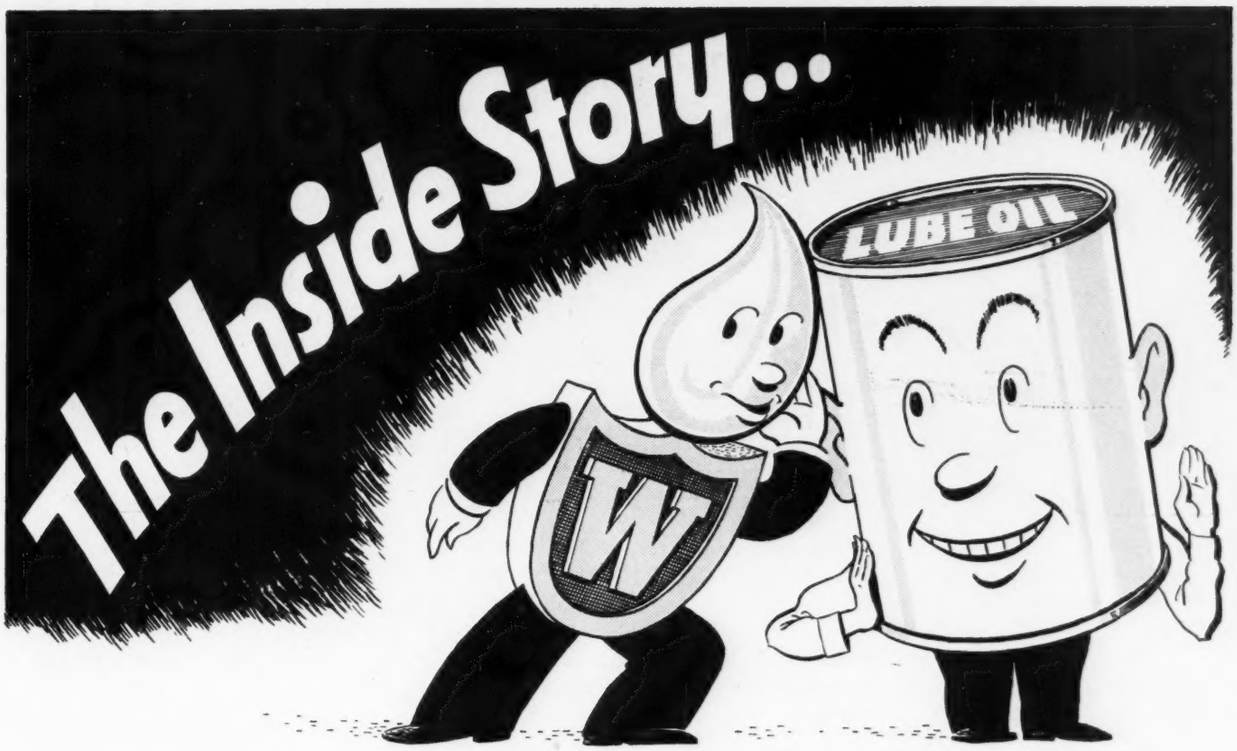
Finishing Operations

After two passes of the mechanically-operated finishing machine, the pavement surface was given a careful treatment consisting of five successive operations in hand finishing. These treatments included (1) surfacing with the bull float, (2) one pass of a cutting screed, (3) second treatment with the bull float, (4) two passes of a hand belt finishing tool and, finally, (5) a 6 room finish to give the surface an anti-skid effect. In the hangar the pavement was steel troweled for a hard, smooth surface. Colored lines will mark the boundaries of the different thicknesses of pavement to indicate the limits of prescribed loadings.

Heat dissipation in the 12- and 18-

(Continued on page 180)

The Inside Story...



Clean oil is vital for efficient operation of those tough, rugged motors that power heavy construction machinery. Here's the *inside* story—for sustained efficiency the precision-machined parts of modern heavy-duty engines must be lubricated with *clean* oil—oil free of grit, acid and moisture. That's exactly the purpose for which Winslow Full-Flow *in line* Oil Conditioners and Winslow Free-Flo Replacement Elements were designed.

Winslow Replacement Elements—made in more than 130 different sizes to fit any standard make filter—embody exclusive, patented features. One of these features gives extra capacity to consistently pass and condition lube oil over a longer period of time . . . because the element *expands with use.* This means maximum porosity and oil cleaning ability long after ordinary filter elements become clogged.

In addition to the full line of lube oil Conditioners and Replacement Elements, Winslow also makes a wide range of fuel oil filters. Order from your jobber today.

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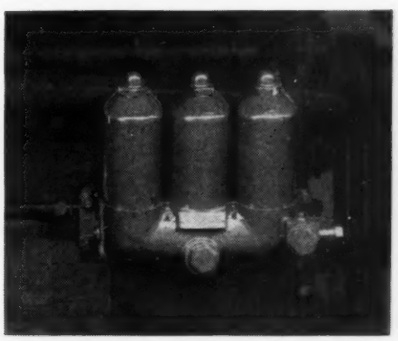

Winslow full-flow installation on Hall-Scott Model 400 heavy-duty truck motor.

For sustained efficiency the precision-machined parts of modern heavy-duty engines must be lubricated with *clean* oil—oil free of grit, acid and moisture.

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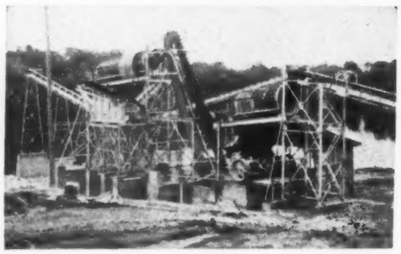

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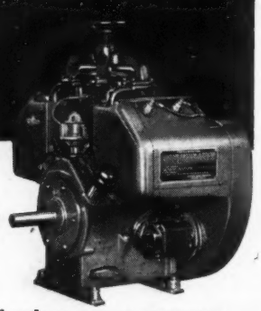
are equipped with EXTENDED SHAFT for Power Drive



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WISCONSIN MOTOR Corporation
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World's Largest Builders of Heavy-Duty Air-Cooled Engines

(Continued from page 178)

in. slabs was aided by water curing, so this method was used rather than that of seal coating as in the case of the 9-in. slab. Aid in heat dissipation was considered an advantage, especially for the 18-in. slab which contained as much as 6.07 sacks of cement per cu. yd.

★ ★ ★

Stepped-Up Maintenance

(Continued from page 91)

we get much better service by following recommendations and also that the cables require less grease. At the beginning of the war we switched to all preformed cable for heavy equipment. We find that we can crowd this type of cable harder.

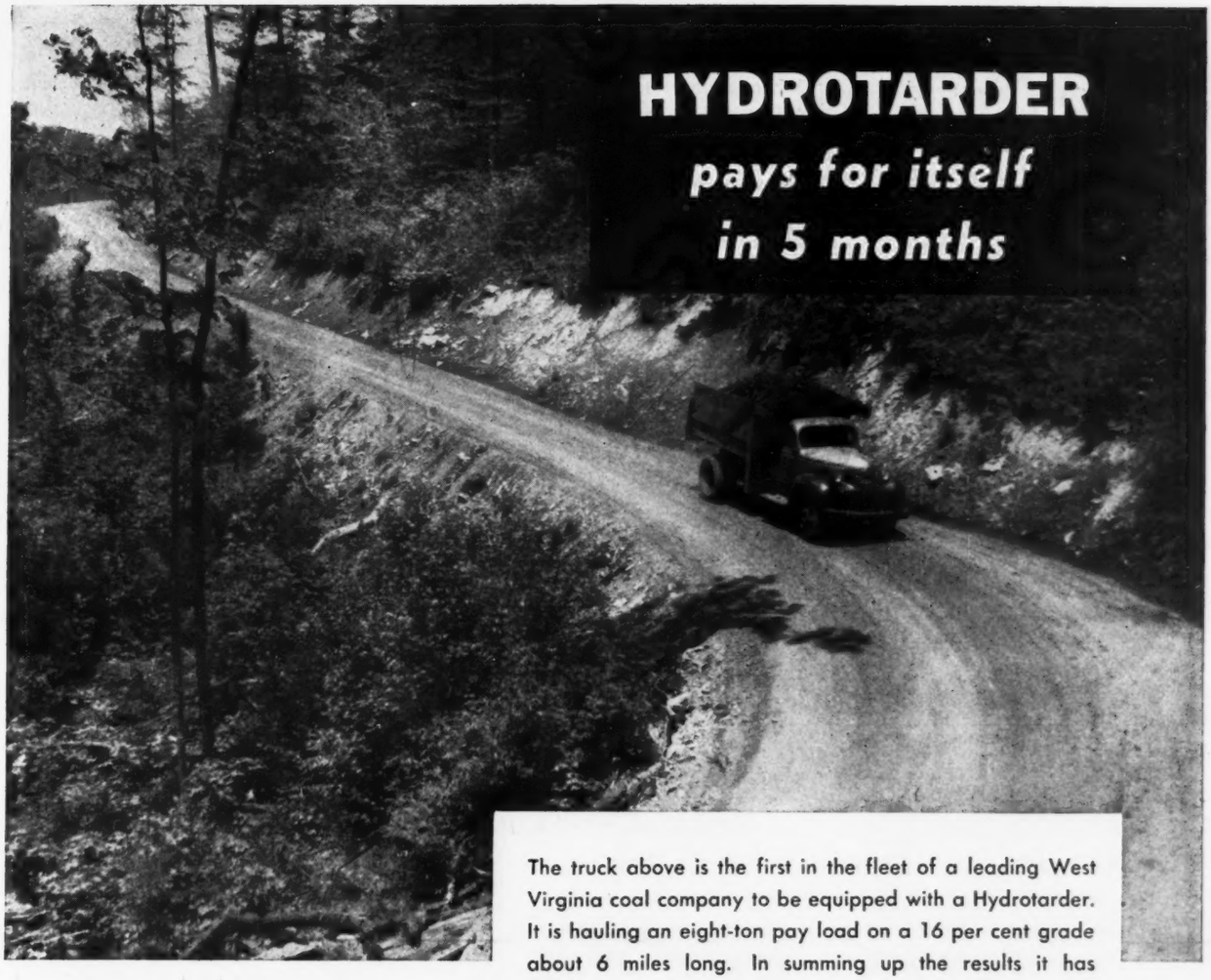
On the weekly one-day lay-up for service and repairs, one mechanic is assigned to servicing cables on all equipment. We have found this method saves time; also, by using the same man on this type of work, we get better life from our ropes. A rope which has been retired is given regular storage inspection and servicing before it is assigned to another machine. In many cases we have received as good wear from a retired cable as from a new one. This was not true before we adopted our present maintenance policy. When a new or used cable is put on a machine it is always run through a number of times before work begins.

We use two booms for the combination change on the shovel and dragline. The second boom was made in our own shop and we are now building a third one. After we change booms we always run the cable through a number of times. Just as with a new cable, this gives the rope a chance to adjust itself to the new angles and stresses. The result is longer life and better operation.

Maintenance Pays Its Way

In crowding worn equipment there is no substitute for stepped-up maintenance. While we have no hour and specific charge record, I know that the cost of "extra" maintenance is an unimportant operation factor when balanced against the increased output. It is my belief that when new equipment comes on the market, the maintenance lessons

(Continued on page 182)



The truck above is the first in the fleet of a leading West Virginia coal company to be equipped with a Hydrotarder. It is hauling an eight-ton pay load on a 16 per cent grade about 6 miles long. In summing up the results it has achieved, the company states that the Hydrotarder has enabled this truck to haul 25 per cent more coal per day and will pay for itself in extra coal hauled alone in only seven months. And when savings on brake and engine maintenance are included it will pay for itself in only five months.

This user goes on to say that the Hydrotarder has also contributed immeasurably to the safety of their operators by making it impossible for a truck to skid or get out of control on down grades.

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(Continued from page 182)

which operators have learned by necessity these last few years are going to stand them in good stead. I know in our own case, if new equipment is given half the maintenance and service which is now the policy, it is bound to show a much lower operation charge. Crowding war-worn equipment has taught us how to crowd new equipment safely, once we have it again.

★ ★ ★

TVA

Reservoir Clearing

(Continued from page 112)

balancing only added to the weight of the machine without correcting the trouble. Some practical support had to be provided for the boom, something that could be taken through the swamps with the machine; and, if necessary, quickly

(Continued on page 184)

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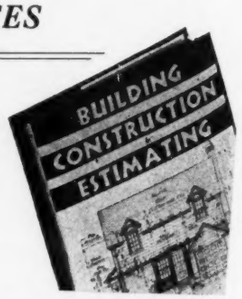

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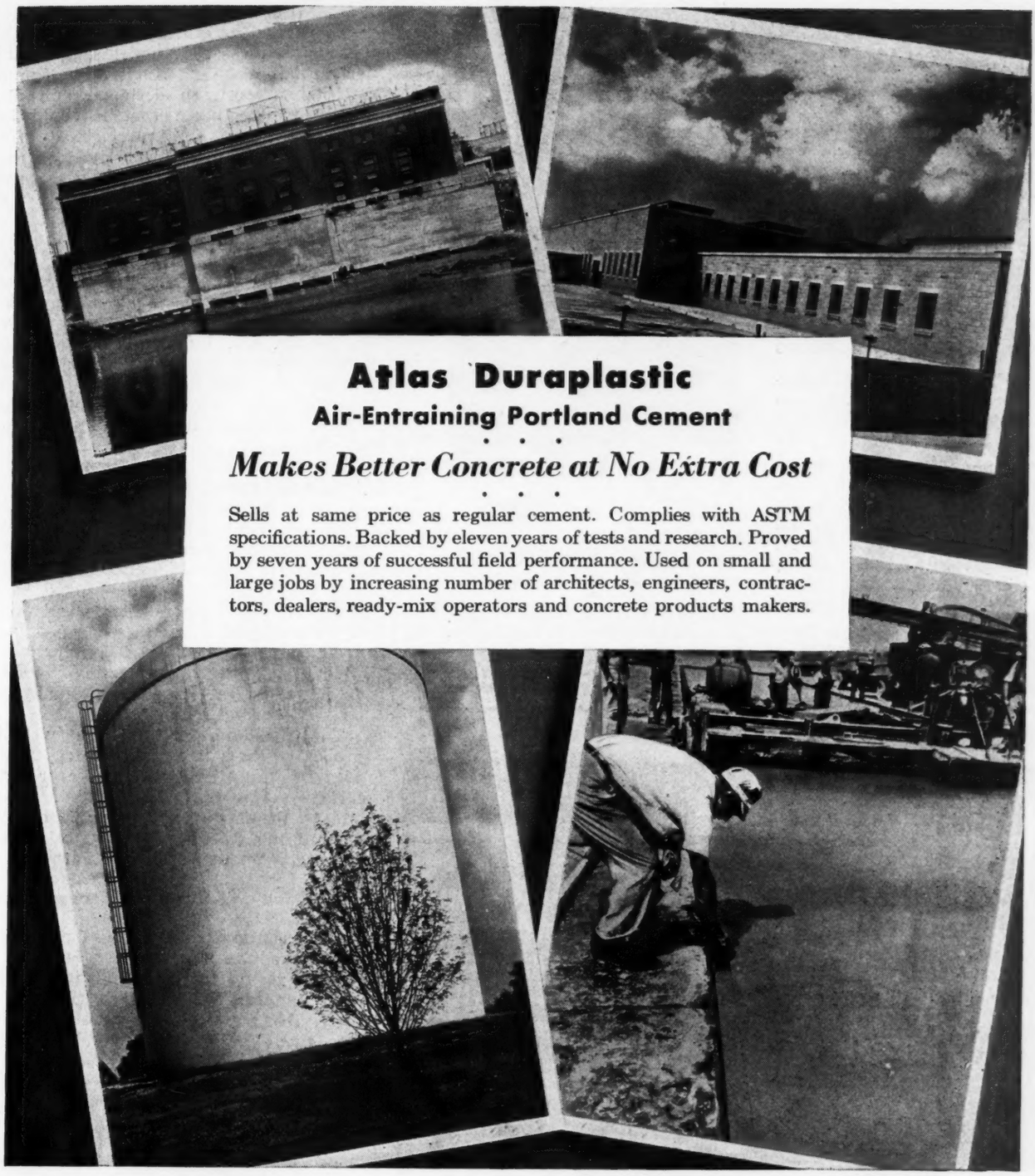

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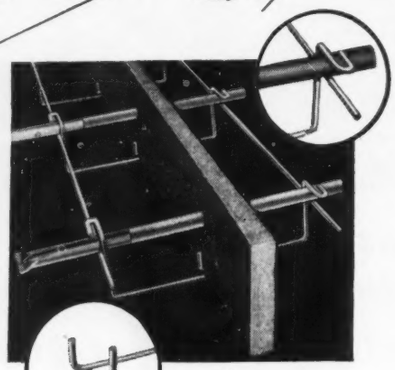

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(Continued from page 182)

detached and as quickly reassembled.

To meet these requirements, Mr. Miller built in the field shops an A-frame stiff-leg support, so designed and attached to the boom that it could be quickly dropped into place, ready for work when the machine arrived on the job. It provided the last link in one of the most useful pieces of equipment the Division ever used.

The stiff legs which formed the A-frame consisted of two pieces of 4-in. triple-strength pipe, anchored by means of U-bolt and eye to the underside of the boom at a point approximately 6 in. below the top. By anchoring the legs in this manner they were given a free, swinging movement. To hold them in an "A" formation and furnish a good foundation on which to rest, a flexible foot was installed.

The flexible foot was made in two sections, each constructed of channel iron, 12x3¼ x ¾ in., 48 in. long. These sections were hinged together at the inside ends, providing a self-adjusting base 96 in. long. To maintain flexibility, the stiff legs were attached to the hinged base from each end—with eyebolts and pins. Serving as a foundation for the A-frame boom support, this broad foot held up well in soft ground; its flexibility added to its value on irregular ground and among logs and stumps.

To help hold the stiff legs in their proper position, two spreader-legs made of 3-in. triple-strength pipe, were attached to the stiff legs near the foot; and to the boom carriage shaft on the side of the tractor, about 60 in. apart. (See accompanying illustrations.)

Modifications Increase Effectiveness

With continued use of the equipment, some modifications were effected. A wide-gage tractor was substituted for the standard-gage machine; RD-6's and later, D6's replaced the Caterpillar 35. For the sake of maneuverability, the boom was cut from 17 ft. to 9 ft. 6 in., and the stiff legs and spreader legs were reduced to 8 ft. 10 in. A traveling-type fairlead was installed to insure uniform winding of the cable on the skidding drum; the flanges on the skidding drum, which had been constantly breaking, were re-designed to provide a thickness of 1 in., instead of the standard ¾ in. A protector screen was placed on the side of the tractor between the tractor seat and the side boom to guard the operator from limbs and from the kickback of broken cables.

After its development at Wheeler, the bank-pulling machine became a component part of each bank unit, an organization specifically set up to clear the stream banks. Manned by an operator, and with five to seven riggers to handle

(Continued on page 186)

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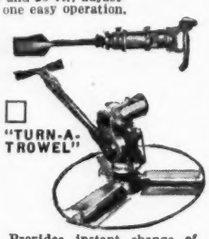

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(Continued from page 184)

the cable, the machine was fast, efficient, and economical of operation. Following the crews which sawed the leaning trees, allowing them to fall into the water, the bank-pulling machine removed them about as fast as they were cut. In many places it made possible a satisfactory job which, without its help, would have been impossible to accomplish. Its great money value to the jobs on which it has been used is reflected in reduced costs of bank clearing.

Power Timber Rake Developed

Even more startling than the bank-pulling machine in its contribution to the efficiency of clearing jobs is a simple attachment, also developed by the Division, known as the power timber rake.

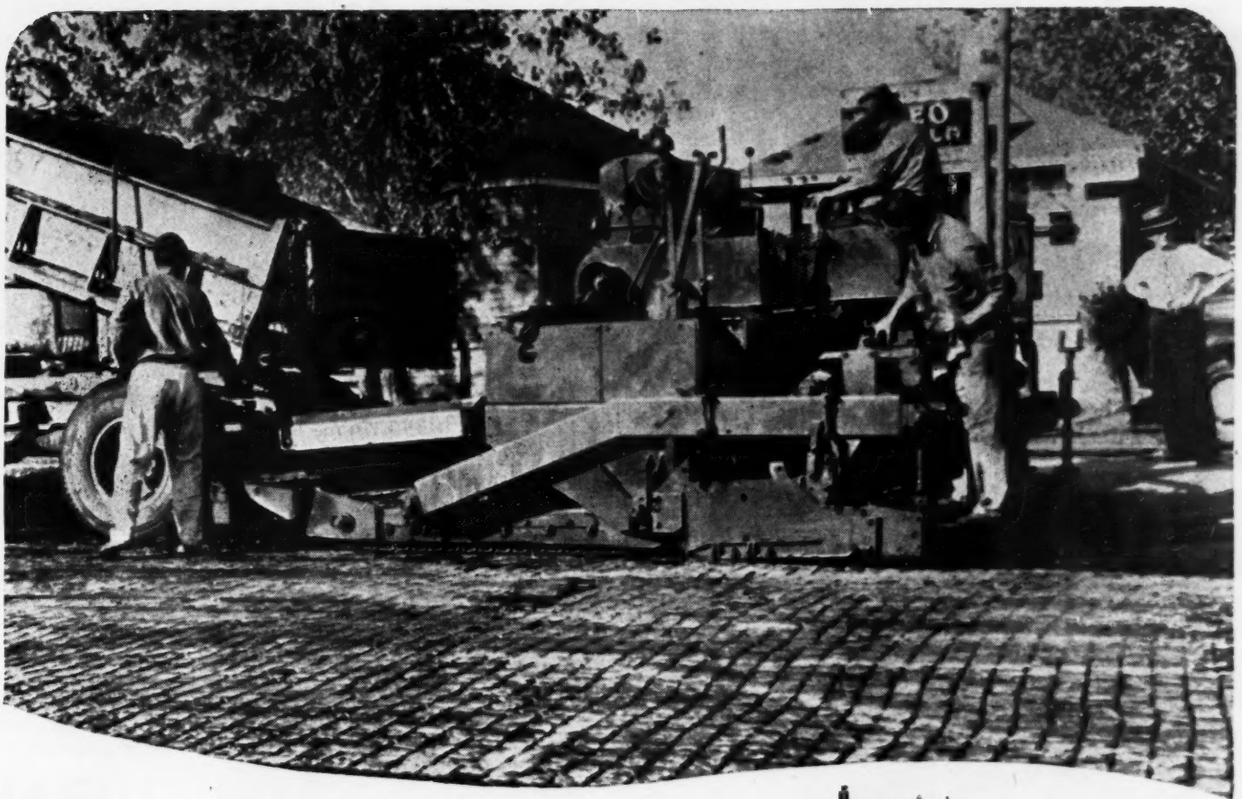
In the Tennessee Valley, debris from clearing operations had to be compactly piled before it could be satisfactorily burned. After the trees had been felled, the greater part of the manpower consumed in the clearing operation was for conditioning the timber prior to burning. Underbrush was piled as cut; larger timber was trimmed and the limbs piled; and tree trunks were sawed into logs 12 to 14 ft. long, the merchantable timber salvaged, and the remainder bedded with mule teams for piling and burning. It had always been the ambition of the Division to develop a method for assembling felled whole trees for burning without any further conditioning.

Many experiments were run. The hope of reducing costs by use of machinery was always present, and the temptation to change to machine methods was sometimes great; but, when reduced to cold economics, use of equipment did not meet the test of time and cost established by the orthodox method of clearing, and the timber never was in as good condition for burning.

If the great mass of timber could be shoved together amid the stumps and the irregularities of the ground, the problem would be solved. A bulldozer could not work under such conditions and would, in any case, scrape up too much earth. Studies of timber rakes in use outside of the Valley showed that those rakes wouldn't do the job satisfactorily; their teeth, rigidly fixed, stood too nearly vertical. In addition to the problem of stumps, they raked up so much earth that the timber had to be dug out before it could be burned.

On a clearing job in the Middle West, a Division representative found that the contractor had designed a rake which was rendering very good service. In that arid region of comparatively small timber, about half the debris could be burned before it was piled. The rake was being used to shove together for

(Continued on page 188)



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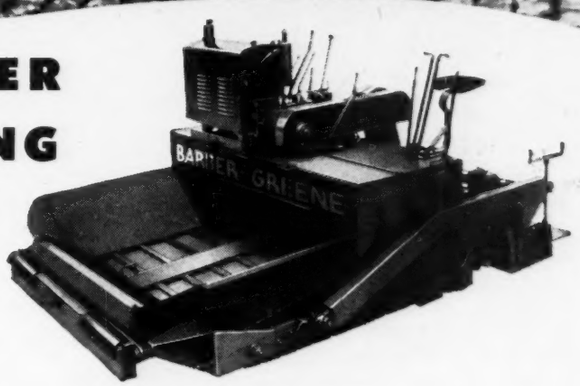

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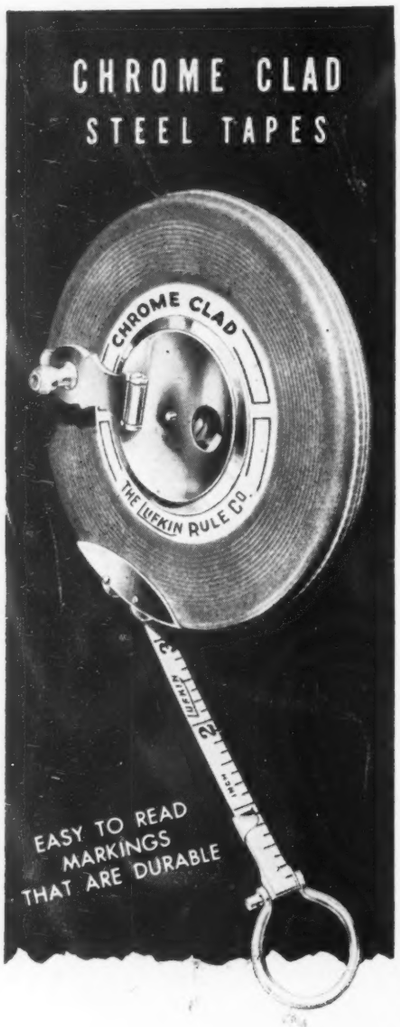

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(Continued from page 186)

complete consumption the remaining material.

This equipment furnished no more than an idea, but it was at least a starting point. Pat A. Miller, who years before had developed the bank-pulling machine, and William R. Holden, administrative officer, were assigned the job of studying the mechanical rake under action, making photographs and drawings, and seeing what could be done to develop the idea into something applicable to work in the Valley.

To crush the timber into a compact mass for burning, the rake had to be propelled by a powerful tractor; an RD8 Caterpillar was procured. The tractor was equipped with a hydraulically-operated bulldozer blade, minus the cutting bit. The hydraulic lift could not raise the rake high enough nor could it be protected from churning trees and flailing limbs. Accordingly, an overhead single-cable lift was substituted, driven from a power control winch mounted on the rear of the machine, with the cable from the drum to the blade passing over the operator's head. A cage of No. 6 woven steel wire screen on 2-in. centers was installed to protect the operator—overhead, front, and sides—from the heaving timber. The right side of the cage was shorter than the left for convenience in entering and leaving the driver's seat.

Rake Teeth Pinned to Blade

Teeth for the rake—on the design of which depended the success or failure of the attachment—were not rigidly fastened to the blade of the bulldozer but were pivoted on pin connections. Steel struts, drilled for the reception of a removable pin, were welded to the back of the blade on each side of torch-cut slots. The teeth were offset at the top to fit into the slots and were drilled to receive a pin. The teeth were so curved that they slid over the ground ahead of the blade with a free vertical movement, cradling the debris, and holding the load while being lifted over obstructing stumps. When first put into use, each rake was equipped with eight teeth made of alloy steel tempered to take a hard strain but to bend before breaking. It was found, with use, that rakes functioned about as well with only three teeth, which relieved the blade of a considerable amount of weight. Though perfectly designed for their purpose, the teeth did not perform with full efficiency until a barge-shaped slide of steel was welded to the bottom of the blade at each end, maintaining a constant minimum distance between the blade and the ground.

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(Continued on page 190)

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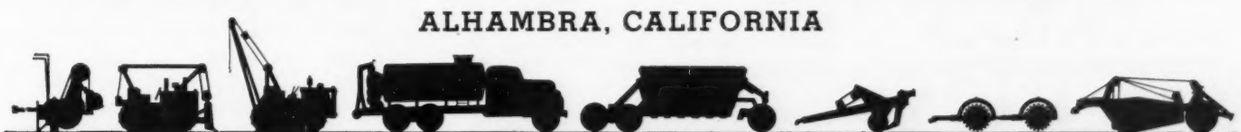

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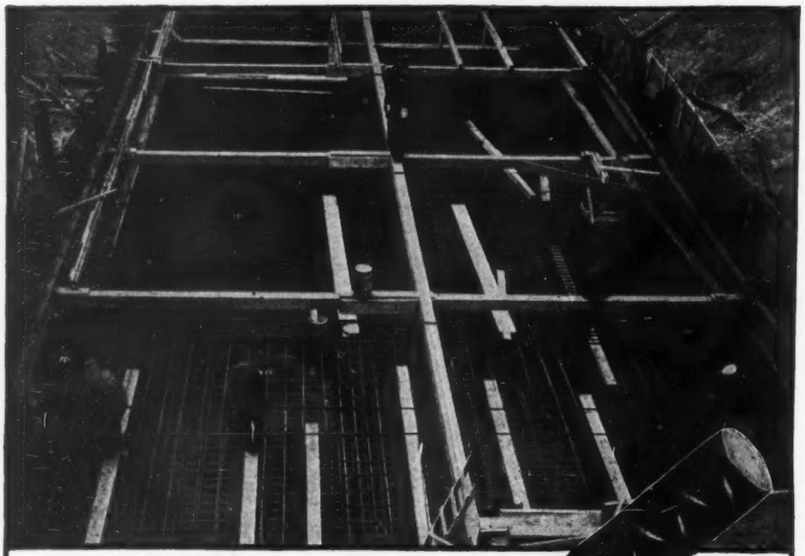

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(Continued from page 188)

traction needed to shove a load, the raking machines were useless on soft ground; but when the great swamp areas had been dried out by the sun of early summer they began to function at maximum efficiency, even going in on the floor of former tupelo lakes that had been drained. Timber for the rakes had only to be felled, an effort being made to throw it all one way and to cut the stumps as low as practicable.

Moving in on a prepared area, the machines gathered the debris on their curved teeth and began shoving it forward. The accumulating load became a mass of timber higher than the machine, rolling forward with a snapping of tree trunks and cracking of limbs. Behind the machine was a strip cleared of debris. When the load could be shoved no further, the machine returned for another and rammed it in beside the first, forming an ever lengthening wall across the area. Then it brought in timber from the other side of the wall, forming a giant windrow of crushed debris so compactly hammered into place that after it had seasoned for a few weeks it burned readily, leaving little unconsumed material.

Clearing Schedules Bettered

The power timber rake was developed for use in the Watts Bar Reservoir; but as soon as its efficiency was proved, it was shipped to the Kentucky Dam Reservoir. There, with nearly 50,000 acres of forest to clear, a year was cut from the time allotted for completion. Every day the labor shortage grew more acute. As fast as tractors for motive power and material to convert them into rakes could be obtained, twelve were equipped in the Divisions's shops. Both Caterpillar D8's with Le Tourneau cable-operated bulldozers and Allis-Chalmers HD-14's with Buckeye cable-operated blades were used.

While the rake attachments gave little trouble, the maintenance and repair costs on the tractors were rather high, perhaps much higher than if they had been used as bulldozers and backfillers. But the saving in money over the old method of clearing timber was great—several hundred thousand dollars on the Kentucky Dam job alone. Taking the place of about 40 men, each rake filled a gap in labor supply and helped the Division to maintain its reservoir clearance schedule. The power rakes piled timber from an area of nearly 28,000 acres, and if tractors and the accessories for converting them into additional raking machines had been available, the resulting equipment would have done even a larger share of the job.

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Fast, economical handling possible because of their light weight.

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OWEN BUCKETS

A MOUTHFUL AT EVERY BITE

Stilwell Road

(Continued from page 108)

a week. To avoid interfering with regular traffic, the Engineers send out two motor patrols, each taking half the road and going in the direction of traffic. When the weather is unusually dry a water-sprinkler truck precedes the gravel carriers. During extremely wet weather, the roads are reconditioned with drags made of timber and old grader blades.

Other maintenance work includes extending the many short culverts used during initial construction, and widening shoulder revetments. Guard rails are placed on these culverts, and reflectors from salvaged vehicles on the end posts warn approaching traffic of work in progress. Bridge and culvert signs are replaced frequently and kept clean and readable.

Rebuilding Bridges

Many of the original hewn-timber bridges built by Chinese Engineers are being replaced with pile-driven bridges built of timber from sawmills. Other bridges, especially where drainage is not too great, are being replaced with corrugated 6-ft. culverts. On larger rivers, where the standard H-20 truss bridge is used, the men have improvised timber bracing for the steel trusses, thus increasing their carrying capacities. Wherever possible, drains are dug to carry rainwater from the immediate vicinity of the road. Many of these drains are more than ½ mi. long before they reach levels only 2 ft. below the elevation of the road.

One of the most striking jobs recently completed was the replacement of a deteriorated causeway constructed by the Chinese just before last year's monsoon rains. *(Construction Methods, April 1945, p. 58)*. A fill about 2 mi. long and 18 ft. high, involving 215,000 cu.yd. of earth and 10,000 cu.yd. of gravel topping, was placed in record time. A new pile-driven trestle was put in for the river crossing, the channel was relocated by draglines to remove several bands, and a cut-off diversion was made to provide a better channel on the downstream side.

By means of temporary bridges, detours and other devices, the engineers have made vast improvements on the Stilwell Road without delaying China-bound traffic. China's new life-line is being improved daily. Supplies are moving in increasing quantities, and the Engineers are making certain that nothing interferes with that vital part of the war in the Far East.

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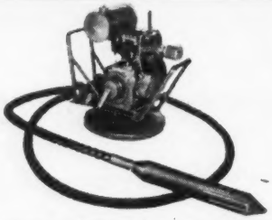

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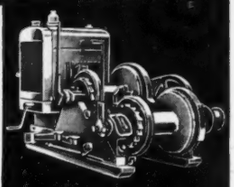

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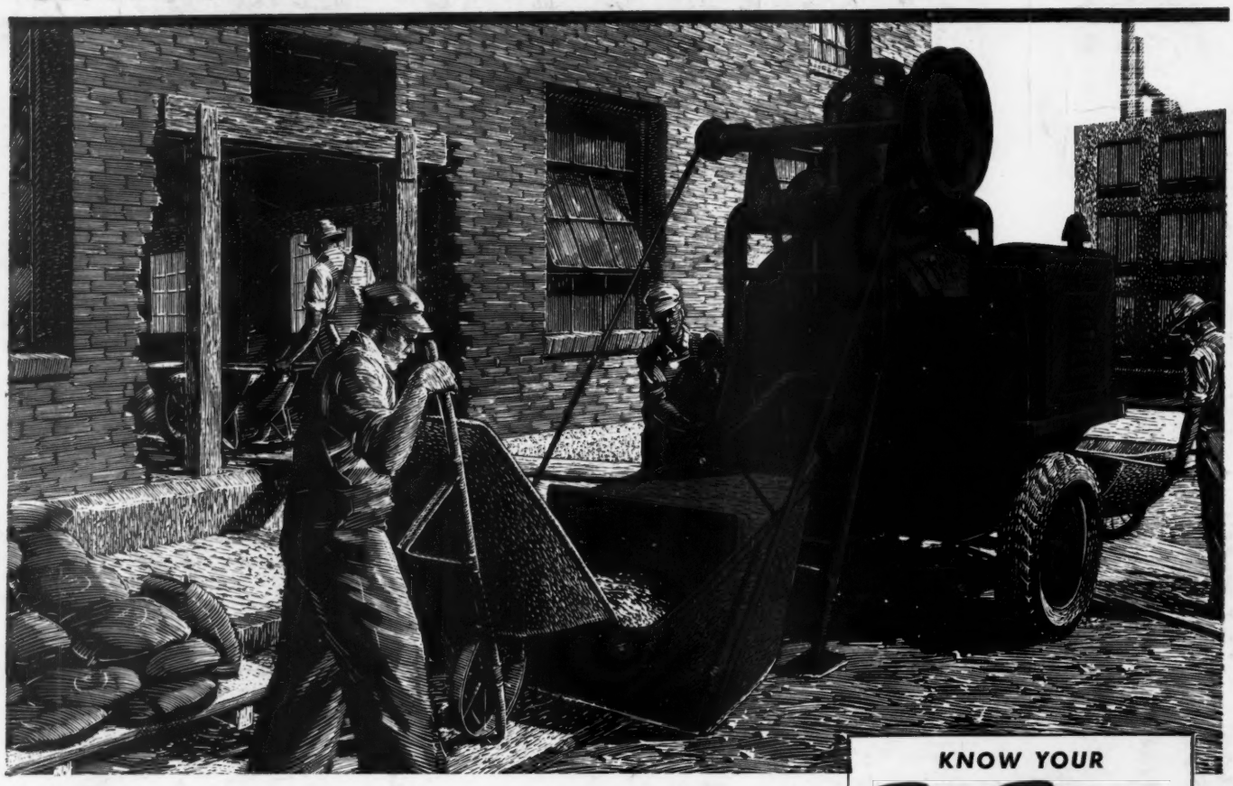
In Business for Your Safety

BETTER CONCRETE FROM ACCURATE WATER CONTROL



Only Ransome Blue Brute mixers, large and small, have all metal spiral cut-offs in the water tank and non-by-passing valves for accuracy of water measurement throughout the life of the mixer.

There are many other reasons why Ransome Blue Brute Mixers have the reputation of making the best concrete at the lowest over-all cost, such as the famous Ransome mixing action perfected during 95 years' experience. The drum tracks of all Ransome mixers are made of high carbon steel for maximum resistance to wear; machined to a true circle after being welded to the drum. Drum rollers of tough car wheel metal, are equipped with double Timken bearings for permanent alignment to assure a smooth-running, long-lived machine with minimum maintenance.

For further details, read Bulletin *No. 181,* available from your nearby Worthington-Ransome Dealer or Blue Brute headquarters.

RB-16

BUY BLUE BRUTES

KNOW YOUR BLUE BRUTES

Your Blue Brute Distributor will gladly show you how Worthington-Ransome Blue Brute construction equipment will put your planning on a profitable basis and prove that *there's more worth in Worthington-Ransome.* Act now! His name is listed on page 194 The number beside his name indicates the Blue Brutes he handles.

1.
Blue Brutes include: Pavers, Concrete Spreaders**, Concrete Mixers, Concrete Placing Equipment, Big Mixers, Finishing Machines**, Pneumatic Placing & Grouting Equipment, Truck Mixers, Plaster & Bituminous Mixers, and accessories.

2.
Blue Brutes also include: Diesel, gasoline and electric driven Portable Compressors from 60 to 500 cu. ft. capacity in mountings to suit all jobs; Rock Drills and Air Tools in a wide range of weights and sizes; Contractors' Pumps.**

**Postwar Products

Truck Mixers
Capacities:
2, 3, 4½, 5½ cu. yds.

Portable Mixers
Capacities:
3½, 7, 10, 14 cu. ft.

Big Stationary Mixers
Capacities:
28, 56, 84, 126 cu. ft.

Pneumatic Placer
Capacity:
7, 14, 28 cu. ft.

WORTHINGTON

Worthington Pump and Machinery Corporation, Worthington-Ransome Construction Equipment Division
Holyoke, Mass.